# MS-812

## Programmable Main Station

## INSTRUCTION and SERVICE MANUAL

945 Camelia St. Berkeley, California 94710 510-527-6666

Clear-Com 810124

11/90 REV.A

# Clear-Com Systems

# MS-812 Programmable Main Station

# Instruction Manual

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Clear-Com Systems
945 Camelia St.
Berkeley, Ca. 94710
U.S.A

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11/90 Rev. 1.0

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## NOTICE ABOUT SPECIFICATIONS

Performance specifications included in this manual are design-center specifications and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

## BEFORE YOU BEGIN . . .

To get the most out of the MS-812 Main Station, read this manual carefully. It will answer questions you might have about the operation and service of the components in the system. Included is a Troubleshooting Section that provides causes and possible solutions to problems you might have with system and component operation. Clear-Com's Customer Service Department is available to answer questions not covered in this manual.

It is assumed you are familiar with the operation of basic intercom systems.

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# SECTION 1
# DESCRIPTION OF THE MS-812 PROGRAMMABLE MASTER INTERCOM STATION

## THE CLEAR-COM CONCEPT

Clear-Com is a closed-circuit intercom system that consistently provides high-clarity, communication in high-noise and low-noise environments. A basic system consists of a single- or multi-channel power supply or main station connected to various single- or multi-channel remote stations.

Clear-Com manufactures a wide variety of both portable and fixed-installation units. All are compatible with each other (Clear-Com can also interface with other communication systems).

Clear-Com stations are interconnected with two-conductor, shielded microphone cable, using 3-pin XLR connectors. One wire carries the DC power (28-30 volts) from a main station or power supply to all remote stations, and the other wire carries audio information. The shield acts as a common ground. One termination (per channel) is needed throughout the intercom network, and is usually located in the main station or power supply.

Clear-Com is a distributed amplifier system; each main and remote station houses its own mic preamplifier (for headset or speaker) and signaling circuitry. The Automatic Headset Detection circuit shuts off a station's mic pre-amp when the headset is disconnected, so background noise on the line is not increased by an unused yet on-line station. Low-impedance mic input lines (200 Ohms) and specially designed circuitry make Clear-Com channels virtually immune to RFI and dimmer noise.

Clear-Com main stations, power supplies and certain remote stations each have an auxiliary program input with its own volume control, which allows an external audio source to be fed to the intercom system.

Visual Signal Circuitry (CALL Lights), a standard feature on most main and remote stations, allows the user to attract the attention of operators who have removed their headsets.

Depending upon the type of main and remote stations selected and assuming that enough DC power is available, a maximum number of remote stations from 13 (all speaker stations) to 100 (all headset stations) can be distributed along a mile of wire. Remote stations bridge the intercom line at a very high impedance (>15 KOhms), and place a minimum load on the line. The audio level always remains constant, and does not fluctuate as stations leave and join the network.

The 28-30 volts DC provided by main stations and power supply units enable remote stations to operate with minimal current (25 mA. quiescent for headset stations, 50 mA. quiescent for speaker stations) while generating extremely loud listen volumes (greater than 110 dB SPL using Clear-Com Headsets). The higher voltage and low current keep voltage losses to an absolute minimum in long lines. If the supply voltage drops due to the addition of great length of cable or many more stations, Clear-Com equipment will continue operating with less than 12 volts available.

## 1.1 MS-812 OVERALL DESCRIPTION

The MS-812 Intercom station is a 12 channel fully programmable micro-processor controlled Master station intended to work with other Clear-Com Party-Line products. All aspects of the station operation are under micro-processor control with many operational parameters programmable by the user. An LCD display is used to assist the user in programming. The user programmed functions are saved in Non-Volatile memory (EEPROM Memory) and are retained during power-down.

The MS-812 directly supports Clear-Com's IFB and ISO systems. Up to eight channels of IFB can be controlled directly by the existing front panel buttons. The MS-812 directly replaces the use of an AX-4 or MA-4 in a PIC-4000 based system. Up to sixteen channels of Clear-Com ISO-4000 can be controlled directly by existing front panel buttons eliminating the need for external ICP-4 control modules.

The Line-Drive amplifiers of the unit are built on plug-in modules each containing four channels. There are provisions for five such modules. Three modules provide twelve channels of intercom. The remaining two provide eight channels of IFB. If a module is not used in a given application it need not be installed. These modules are 'hot-patchable' to ease repair.

PHYSICAL DESCRIPTION: The MS-812 is built in a 19 inch rack mount chassis 3 1/2 inches high. The depth is approximately 9 1/4 inches.

POWER SUPPLY IS INTERNAL: The internal power supply is intended to operate only the internal circuitry of one unit and requires connection to 120/240 VAC 50/60 Hz. The external Intercom system will need a standard Clear-Com power supply.

SYSTEM INTERCONNECT: A portion of the rear panel is removable offering the user several options on type of system interconnection. The standard version of the MS-812 is shipped with 12 XLR connectors for CC intercom lines with line termination jumpers available from the rear of the unit. Other options available are:

CP-56 -- Two paralleled 56 pin ELCO/EDAC connectors provide Multi-pair cable connection between stations and Clear-Com's IP-1200 System Interface Panel.

CP-30 -- Two 30 pin Tuchel connectors wired like a MS-808 for connection into existing MS-808 systems.

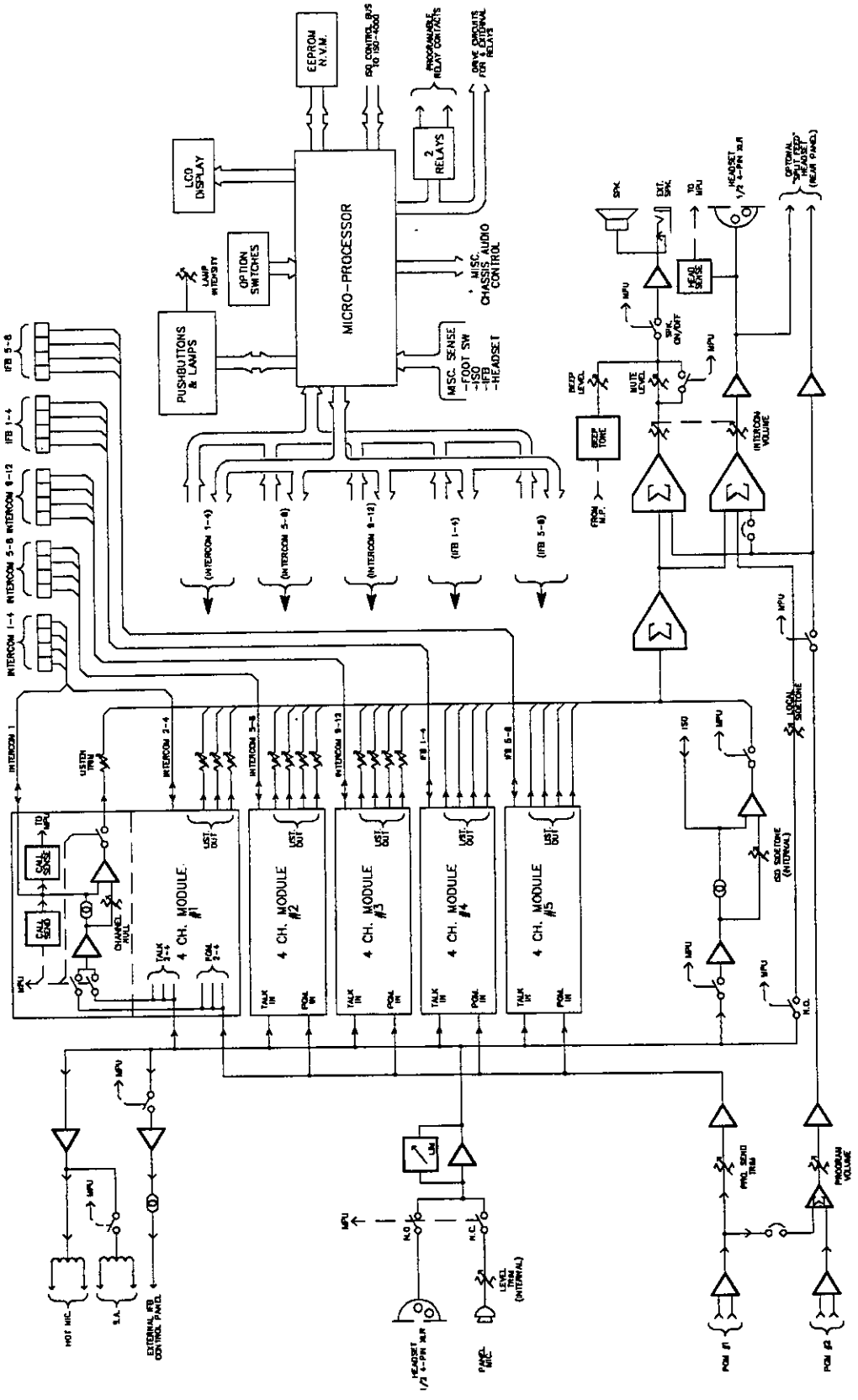



**FIGURE 1.1**
**MS-812 BLOCK DIAGRAM**

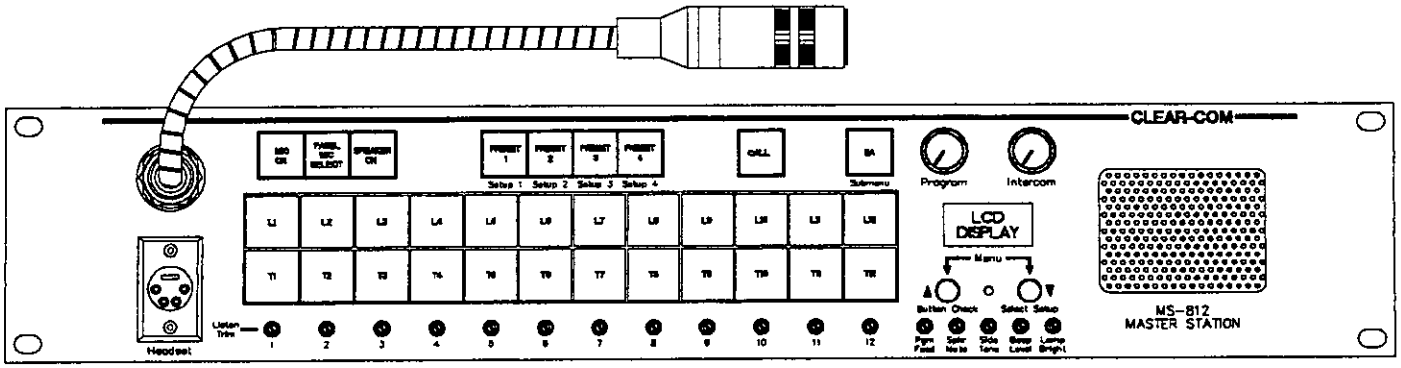



**FIGURE 1.2**
**FRONT PANEL**

## 1.2 FRONT PANEL DESCRIPTION

All front panel pushbuttons, except the two programming buttons, are illuminated and under control of the micro-processor. The legends in the keycaps are removable and changeable by the user. The overall brightness of the button illumination is set by a front panel trim control.

-- PANEL MOUNT ELECTRET MICROPHONE
-- HEADSET JACK (MONO)
-- FRONT PANEL SPEAKER

-- MIC ON/OFF Button and ON indication.
-- PANEL MIC SELECT Button and indication.
-- SPEAKER ON/OFF Button and ON indication.
-- 4 PRESET Buttons (Programmable)
-- SA Button (Stage/Studio Announce)
-- CALL FUNCTION Enable Button

-- 24 SELECTOR Buttons
-- 12 LISTEN LEVEL Trim Controls

-- PROGRAM Listen Level Control
-- MASTER Intercom Level Control

-- 8 Char X 2 Row LCD Display
-- 2 PROGRAM SETUP BUTTONS
-- DEFAULT RESET BUTTON (Accessible through a hole between SETUP buttons)

-- TRIM CONTROLS: PROGRAM FEED LEVEL to intercom Lines
SPEAKER MUTE LEVEL
BEEP TONE LEVEL (Speaker only)
LOCAL SIDETONE LEVEL (Headphone only)
LAMP INTENSITY

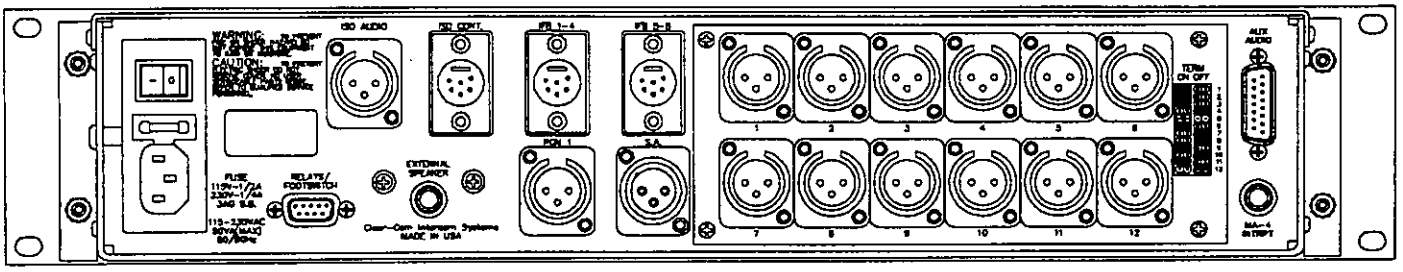


FIGURE 1.3 (XLR OPTION)

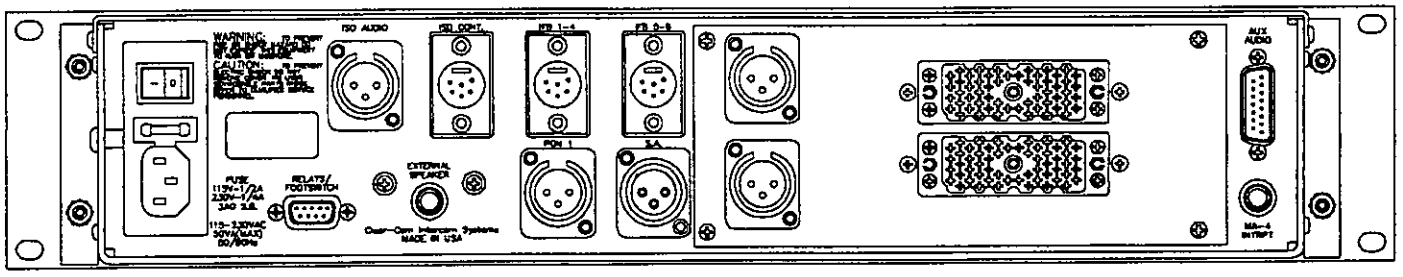


FIGURE 1.4 (ELCO/EDAC OPTION)

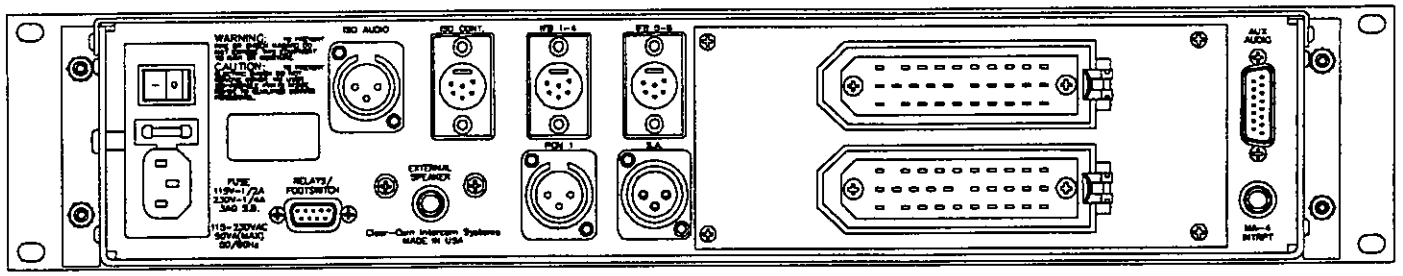


FIGURE 1.5 (TUCHEL OPTION)

## 1.3 REAR PANEL DESCRIPTION

--INTERCOM SYSTEM CONNECTIONS: To accommodate different sizes and types of systems a section of the rear panel is a removable plate allowing several optional connector schemes to be implemented.

-- 12 XLR Clear-Com Intercom connectors with jumper selectable line terminators.
-- Two paralleled 56 pin ELCO or EDAC connectors to provide loop-through or connection to a system. This option requires termination to be provided externally.
-- Two 30 pin Tuchel connectors wired like a MS-808 for connection into existing 808 systems with no termination.

-- PROGRAM INPUT #1: ----- (XLR-3F)
-- SA OUTPUT: ---------- (XLR-3M)
-- EXT. SPEAKER ---------- (1/4 " Phone)
-- MA-4 Link ---------- (1/4 " Phone)

-- A DB-9F "RELAY/FOOTSWITCH':
2 SETS of LOCAL RELAY CONTACTS
FOOT-SWITCH input.

-- AC POWER Connector ---- (CE 22/V)
-- AC POWER Switch
-- AC POWER Fuse

-- ISO/IFB OPTION:
TWO IFB FEEDs: ---------- (XLR-6M)
ISO-4000 Transfer Audio- (XLR-3M)
ISO-4000 Control ---------- (XLR-6M)

-- A DB-15F "AUX AUDIO"
PROGRAM INPUT #2
HOT-MIC OUT
STEREO HEADSET Connection

## 1.4 INTERNAL OPTIONS AND ADJUSTMENTS

-- SIDE-TONE NULL adjust controls for all line drivers.
-- GAIN TRIM for the PANEL MICROPHONE (+/- 5 dB).
-- DIP SWITCHES for enabling PROGRAMING options.
-- AC POWER Voltage SELECTION
-- INTERNAL JUMPERS provide user options:

Listen feed from Program #1
Left Ear Program Feed
SA Feed to ELCO Cable

## 1.5 MS-812 POSSIBLE CONFIGURATIONS

The internal circuitry of the MS-812 is constructed to accept up to five 4-channel Line Driver modules. Various configurations and sizes of the machine can be realized. Line Driver modules support intercom and external IFB channels.

The following are the common configurations:

--2 Modules--

8 Ch Intercom
8 Ch Intercom & 4-8 Ch ISO

--3 Modules--

12 Ch Intercom
10 Ch Intercom & 4 Ch ISO
8 Ch Intercom & 4 Ch IFB
8 Ch Intercom, 4 Ch IFB, & 4 Ch ISO
4 Ch Intercom, 8 Ch IFB, & 8 Ch ISO

--4 Modules--

12 Ch Intercom
10 Ch Intercom & 4 Ch IFB
8 Ch Intercom & 8 Ch IFB
6 Ch Intercom, 8 Ch IFB, & 4 Ch ISO

*NOTE: Reclocation of modules will be necessary to realize some of these possible configurations. If all possible combinations are needed under software selection then 5 Modules are needed.

## 1.6 DESCRIPTION OF MS-812 FAMILY PRODUCTS

**MS-812-8** -- This model is shipped with two line amp modules and an XLR back-panel. ISO/IFB options are not installed. This model provides eight channels of intercom.

**MS-812-12** -- This model is shipped with three line amp modules and an XLR pack-panel. ISO/IFB options are not installed. This model provides twelve channels of intercom.

**IFB-40** -- is a four channel IFB and ISO Option that adds one additional line amplifier module to the station and rear panel connectors are installed for IFB and ISO operation.

**IFB-80** -- is an eight channel IFB and ISO Option that adds two additional line amplifier modules to the station and rear panel connectors are installed for IFB and ISO operation.

**ISO-16** -- is an option that provides just the rear panel connectors installed for IFB and ISO operation.

**710229** -- is the Four Channel Line Driver module and can be ordered separately for expansion of an existing system.

**CP-56** -- is the dual "loop thru" ELCO/EDAC 56 Pin Connector Option panel for the rear panel for interconnecting stations via a single multi-pair cable.

**CP-30** -- is the dual "loop thru" TUCHEL 30 pin Connector Option Panel for the rear panel for interconnecting into an existing MS-808 system using the multi-pair cable used in that system.

**IP-1200** -- is an interconnect panel designed specifically to terminate and provide individual channel breakout when interconnecting MS-812's with an ELCO cable. This panel also provides power distribution with overload protection for external individual intercom lines such as Belt Packs.

The IP-1200 also has program inputs that can be feed to all MS-812s connected. Also, a global SA output is available that any of the MS-812s can feed. There are four relays in the IP-1200 that any of the MS-812s can operate.

**ELCO CABLES** -- Pre-made 56 Pin multi-pair ELCO/EDAC cables are available both from Clear-Com and independent sources. Contact factory for details.

## 1.7 MS-812 SPECIAL FEATURES

**MULTIPLE SETUP MEMORIES:** The attributes and functions of the buttons and many other station functions are programmable by the user and are saved in Non-Volatile (EEPROM) memory. Four banks of memory are available allowing FOUR complete SETUPs to reside in the machine. Four completely different setups can be ready to operate anytime.

**BUTTON ACTION:** All buttons on the front are both latching or momentary in action. A short press of the button causes a latching of the function. Holding the button causes the button press to only have action while the button is pressed (momentary). The latching function of any button can be disabled in the programming mode.

**BUTTON CHECK FUNCTION:** A special diagnostic function allows the user to identify all programming options that have been assigned to any button.

**PRESETS:** Four user programmed preset buttons are available. Each preset button can be programmed to operate any key combination on the station.

**FOOT SWITCH INPUT:** A rear panel input allows the logical control of any front panel function via a FOOT SWITCH or other logic input.

**USER CONTROLLED RELAYS:** Two local and four global system relays may be programmed to any button on the front panel. The contacts of the local relays are available on the rear panel of the station. The 'global' relays are located external to the station.

**AUTOMATIC HEADSET DETECTION:** The connection of a headset is sensed and the Headset Microphone is switched on and the Speaker and Panel Mic is switched off. Unplugging of the headset returns the station to Panel Mic and Speaker operation. While the headset is plugged in, manual selection of microphones and speaker is available.

**TWO PROGRAM FEEDS:** Rear panel connectors allow program inputs for two different purposes. One directly feeds the Speaker or Headphone through a front panel level control. The other is used to selectively feed the 12 intercom channels.

**PROGRAM INTERRUPT:** A single channel interruptible program (PROGRAM #2) feed to each TALK channel is available. This function is programmable on a channel by channel basis.

**PRIVATE TALK/LISTEN FUNCTION:** A button can be temporally programmed to disable all other talks and listens to all channels except the one being talked to.

**CALL IN FUNCTION:** An incoming CALL signal will flash the LISTEN button for the channel. The flashing CALL indication will time out and disappear after a preset time period. This time out period is programmable. Whether or not a CALL signal can be received on a particular channel is programmable.

A BEEP will sound in the speaker when a CALL is received. The BEEP TONE can be disabled or enabled individually.

An incoming call signal can be programmed to activate a LISTEN and/or TALK on that channel.

**CALL OUT FUNCTION:** A CALL button allows sending a call signal out. Pressing the CALL button enables the CALL function. If while the CALL function is enabled, one or more of the TALK buttons is pressed, a CALL signal will be sent to that channel. The CALL function will automatically time out.

Individual TALK buttons can be programmed to send a CALL when pressed.

**IFB (CLEAR-COM PIC-4000):** There are two 4-channel IFB ports available on the rear panel intended to feed a Clear-Com PIC-4000 IFB system. A programming option allows the user to assign,in groups of two, up to eight of the 24 selector buttons to IFB control. Assigning buttons to IFB control takes them away from INTERCOM use. An internal DIP switch enables the MENU item for this function.

**ISO (CLEAR-COM ISO-4000):** The station is designed to connect directly to Clear-Com's ISO-4000 Station Isolation System. A remote station (such as a camera) can be isolated from its normal intercom channel and talked directly to by the ISOing station. A programming option allows the user to assign,in groups of two, up to sixteen of the 24 selector buttons to ISO control. An internal DIP switch enables MENU items for this function.

## 1.8 BRIEF DESCRIPTION OF PROGRAMMING

Most operating parameters of the MS-812 are user programmable making the unit extremely versatile. A two-line by eight character LCD display helps the user in programming by clearly identifying the menu functions. Stepping through the various menu items is done by repeatedly pushing and releasing two SETUP buttons. One SETUP button steps the MENU forward and the other backwards.

Once a menu item is selected the micro-processor guides the user by flashing available buttons for a given programmable function.

The programing Menu is divided into two levels of complexity. Access to the second level (EXTENDED) is enabled by an internal DIP switch.

-- NORMAL: Basic menu items necessary to operate the station for a majority of applications.

-- EXTENDED: Added menu items allowing the user more complex use of the machine.

-- INTERNAL DIP SWITCH OPTIONS: A series of internal DIP switches enables special function menus. These DIP switches only affect the availability of the related menus.

## 1.9 TECHNICAL SPECIFICATIONS:

**CONTROL SYSTEM:** An 8 bit microprocessor (Motorola 68HC11) with 16 K bytes of program memory, 4 K bytes RAM, and 512 bytes EEPROM.

**AMPLIFIER DESIGN:** IC Amplifiers are used extensively. All signal switching is CMOS logic controlled switches. Front panel control of Audio levels is through the use of VCAs.

**MICROPHONE PRE-AMP:**

--Dynamic Headset Input: ---------- Input Impedance - 200 Ohms
Input Level - -55 dBv* nominal
Input Level - -10 dBv* max.
--Panel Mic Input Level: ---------- Input level - -41 dBv* nominal.
Input level adjustment range - +/-5 dB.
--Frequency Response: ---------- 250 Hz to 12 KHz, contoured for intelligibility.
--Limiter Range: ---------- 20 dB
--Gain from Headset to Intercom Line: --------- +41 dB

**HEADPHONE AMPLIFIER:**

--Load Impedance: ---------- 50-2000 Ohms
--Output Level: ---------- at least +20 dBv* across 600 ohm
--Distortion: ---------- <0.2% THD at 1 KHz
--Frequency Response: ---------- 150-18KHz +/-2dB
--Gain from Intercom Line: ---------- +37 dB

**SPEAKER AMPLIFIER:**

--Load Impedance: ---------- 8-50 Ohms
--Output Power: ---------- 4 Watts into 8 ohms
--Distortion: ---------- <0.5% THD at 1 KHz
--Frequency: ---------- 200 Hz to 15 KHz +/- 2 dB
--Gain from Intercom Line: ---------- +41 dB

**PROGRAM INPUTS:**

--Input Level Ref.: ---------- -15 dBv*
--Input Impedance: ---------- >10 KOhms
--Frequency Response: ---------- 150 Hz to 18 KHz

**INTERCOM LINE DRIVE/RECEIVE CIRCUITS:**

--Impedance, Output Load: ---------- > 10 KOhms (200Hz - 10 KHz)
--Level, Nominal Line (200 ohm load): --------- -9 dBv*
--Level, Max Before Clipping (200 ohm load): +5 dBv*
--Sidetone Null Capability: ---------- > 25 dB (200Hz - 10 KHz)
--Crosstalk, Station Induced Ch. to Ch.: ------- >60 dB
--Noise, SN Ratio in Listen Channels: ---------- >60 dB

**INTERCOM SYSTEM SPECIFICATIONS (STANDARD CLEAR-COM):**

Usable Line Quality: up to 100 Stations and 5000 feet of line.
Crosstalk: For 2 lines terminated at one end the crosstalk at the far end shall be: 500 ft < -52dB

**POWER SUPPLY:**
The internal power supply is intended to only power the internals of the MS-812. An external Intercom System must be powered externally. +30V, +15V, and +5V internal power supplies are electronically regulated.

**CONNECTORS:**
--Intercom: ---------- 12 XLR-3 **
--Program: ---------- XLR-3F **
--SA: ---------- XLR-3M **
--Ext. Speaker: ---------- 1/4" Phone Jack
--MA-4 Link: ---------- 1/4" Phone Jack
--Auxiliary Audio Connections: ---------- DB-15F
--Control (Relays and Foot-switch): ---------- DB-9F
--Optional ISO: ---------- XLR-3M & XLR-6M
--Optional IFB: ---------- 2 XLR-6M

**AC POWER REQUIREMENTS:** ---------- 105-130/210-260 VAC, 48 to 62 Hz, 40 VA

**PHYSICAL SPECIFICATIONS:**
--Dimensions: ---------- 19" x 3.5" x 9.25 (483mm x 89mm x 235mm)
--Weight: ---------- 12.0 lbs (5.5 Kg)

**WORKING TEMPERATURE RANGE:** -------- 32-122° F (0-50° C)

* - 0dBv is referenced to 0.775 volts RMS.
Specifications subject to change without notice.

** - All marked circuits appear on the 56-pin ELCO/EDAC Multi-Pin connectors.

## SECTION 2
## INSTALLATION OF THE MS-812 PROGRAMMABLE MASTER INTERCOM STATION

Before You Begin:

Upon receiving the equipment, inspect the shipping boxes for shipping damage. Report all shipping damage to the carrier. Clear-Com is not responsible for damage caused in shipping.

Count and verify receiving all items on the packing list. Do not discard packing materials until all items are found. Clear-Com recommends that your retain the shipping material until after the system is completely installed and working, in case some item must be returned to Clear-Com for warranty service.

### 2.1 INSTALLATION OVERVIEW

The MS-812 is a very versatile intercom station. Installations can vary widely depending on what features are used. The following sections will deal with each feature or group of connectors on the rear panel as they are independent functions.

The overall intercom system should be planned prior to installing a particular station. The following steps should be followed before installing any given station:

1. Create block diagram the entire system. Plan intercom line termination locations.
2. Identify accessory equipment to be used with the system.
3. Plan powering of remote stations and accessory equipment as the MS-812 does not supply system power.
4. Identify station locations.
5. Plan and install cable runs.
6. Identify and set or install internal options in MS-812 stations.
7. Install the MS-812.
8. Check out the hardware installation by exercising the station.
9. Enter the program mode of each individual station and set the desired program options.

**CAUTION:** All Clear-Com Intercom lines must be terminated. **Care must be taken not to fail to terminate or to 'double' terminate a line.** All unused intercom inputs should be terminated to keep the line drive circuits stable.

Clear-Com provides a complete line of intercom products. An important part of this product line is a series of Interface products that allow a user to link Clear-Com with virtually any type of communication system or equipment. The following is brief descriptions of these products:

**AC-10K** ---- Universal interface. Clear-Com to 2, 3, or 4 Wire circuits.
**AC-10H** ---- Telephone interface. Clear-Com to telephone lines.
**IF4-4** -------- 4-Wire/Camera interface. Four channels of Clear-Com to 4 Wire conversion.
**TW-12B** ---- System to System Interface. Provides ground isolation and correct termination between two Clear-Com systems and/or conversion from Clear-Com to RTS systems.
**TWC-10A** -- TW line converter. Converts two Clear-Com lines into a two channel single pair format for two channel "TW" beltpacks.
**TWC-104** -- Four Channel TW line converter. A Four channel version of the TWC-10A.

### 2.1.1 CABLE CONSIDERATIONS:

The Clear-Com intercom line is intended to run on a shielded twisted pair of cable per channel of intercom. One conductor carries full duplex ("two-way") audio, the other conductor carries the DC power for remote stations. The shield is used for ground return for audio and power. When choosing interconnect cable, keep the following considerations in mind:

1. DC resistance of the ground or common conductor affects crosstalk. For runs longer than 100 feet do not use wire smaller than 20 gauge. The total resistance of the ground return (the combined parallel sum of all shields to a location) to any point in the system should be under 1.5 ohms.

2. The capacitance of the interconnect cable affects system frequency response and side-tone stability. Total capacitance should not be greater than 0.25 uF (capacitance between conductor and shield) equivalent to an intercom system containing 5000 feet of cable at 50 pF per foot.

### 2.1.2 PORTABLE INSTALLATION CABLE

Typical cable for portable system interconnections is rubber-jacketed, two-conductor, shielded microphone cable. For runs less than 500 feet a cable made of 24 gauge wire is acceptable. For runs longer than 500 feet use a 20 gauge cable or larger.

Portable remote stations such as belt-packs each have a pair of input and output connectors; when installing a system that includes these, they can be daisy-chained along one interconnect path. Clear-Com provides a one input by three output Line-Splitter (QP-100) that can also simplify wiring. Daisy-Chaining and Line-Splitting decreases the amount of cable required and simplifies the installation.

### 2.1.3 PERMANENT INSTALLATION CABLE

Vinyl-jacketed shielded pair is the cable of choice for permanent installations. Use a low-capacitance 20 gauge wire for short runs (under 500 feet) and 18 gauge cable for runs greater than 500 feet. Placing the cable in conduit is recommended but not necessary.

Multi-pair cable that is individually shielded is acceptable for use in multi-channel systems. For cross-talk considerations the shields must be tied together on both ends of the cable to produce the lowest possible DC path for ground return.

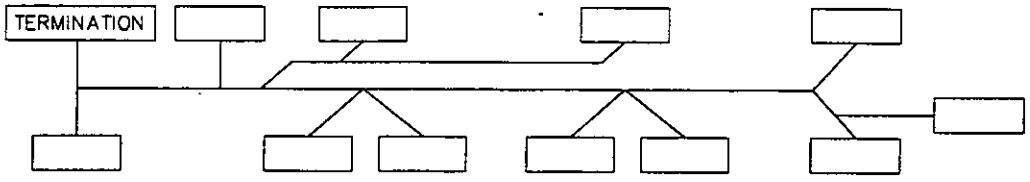
### 2.1.4 CABLE INSTALLATION EFFECTS ON CROSS-TALK

When multiple channels are fed to remote stations, the amount of cross-talk between channels is proportional to the amount of DC resistance in the ground return path back to the termination of the channels. The cable used in Clear-Com's ELCO multi-pair cables has a combined shield resistance of 0.11 ohms per 100 ft. The crosstalk due to cable resistance is predictable with the following chart:

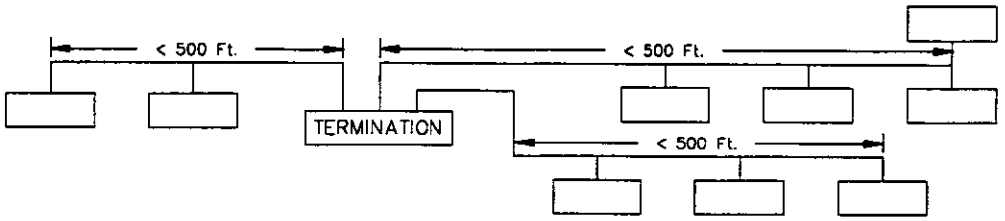
| | |
|---|---|
| 100 ft. --- 61 dB | 700 ft. --- 50 dB |
| 300 ft. --- 57 dB | 900 ft. --- 48 dB |
| 500 ft. --- 52 dB | |

This cross-talk is not present on both ends of the cable. The terminated end of the cable will not contain the cross-talk. The remote end of the cable will have the cross-talk as it is generated in the ground return and not the audio line.

The ideal installation would have all multi-channel cables originate from a central point. The termination for each channel is located at this central point. This type of installation is known as a "Star" type system. If no single multi-channel leg of the "Star" arrangement exceeds 500 ft, the crosstalk should be negligible.




**Unacceptable Installation**




**Recommended Installation**

**Figure 2.1**

Two of the rear panel options for the MS-812 facilitates the use of multi-pair cable in a daisy-chain environment. This configuration will produce acceptable results if the length of any given leg from the central termination location is less than 500 ft. An accessory designed special for use with the MS-812, the IP-1200, would provide a central termination point for the system. The IP-1200 has three paralleled multi-pin connectors providing an easy method of implementing a "Star" arrangement. The IP-1200 also provides breakout connectors with power distribution and overcurrent protection to readily interface to un-powered remote stations.

### 2.1.5 SYSTEM POWER CONSIDERATIONS

The MS-812 is self-powered and does not require DC power from the intercom line. Two or more MS-812s may talk to each other without the need for an external power source.

The MS-812 does not provide any power for external devices, therefore if remote stations that require external power are to be used with a MS-812 an external power source must be provided.

Clear-Com provides a variety of Power Supplies, specially designed for use with Clear-Com equipment. These power supplies have special characteristics and protection that is ideal for intercom service. Other sources of +30 VDC may be used but Clear-Com only guarantees the proper operation of the equipment with Clear-Com power supplies are used.

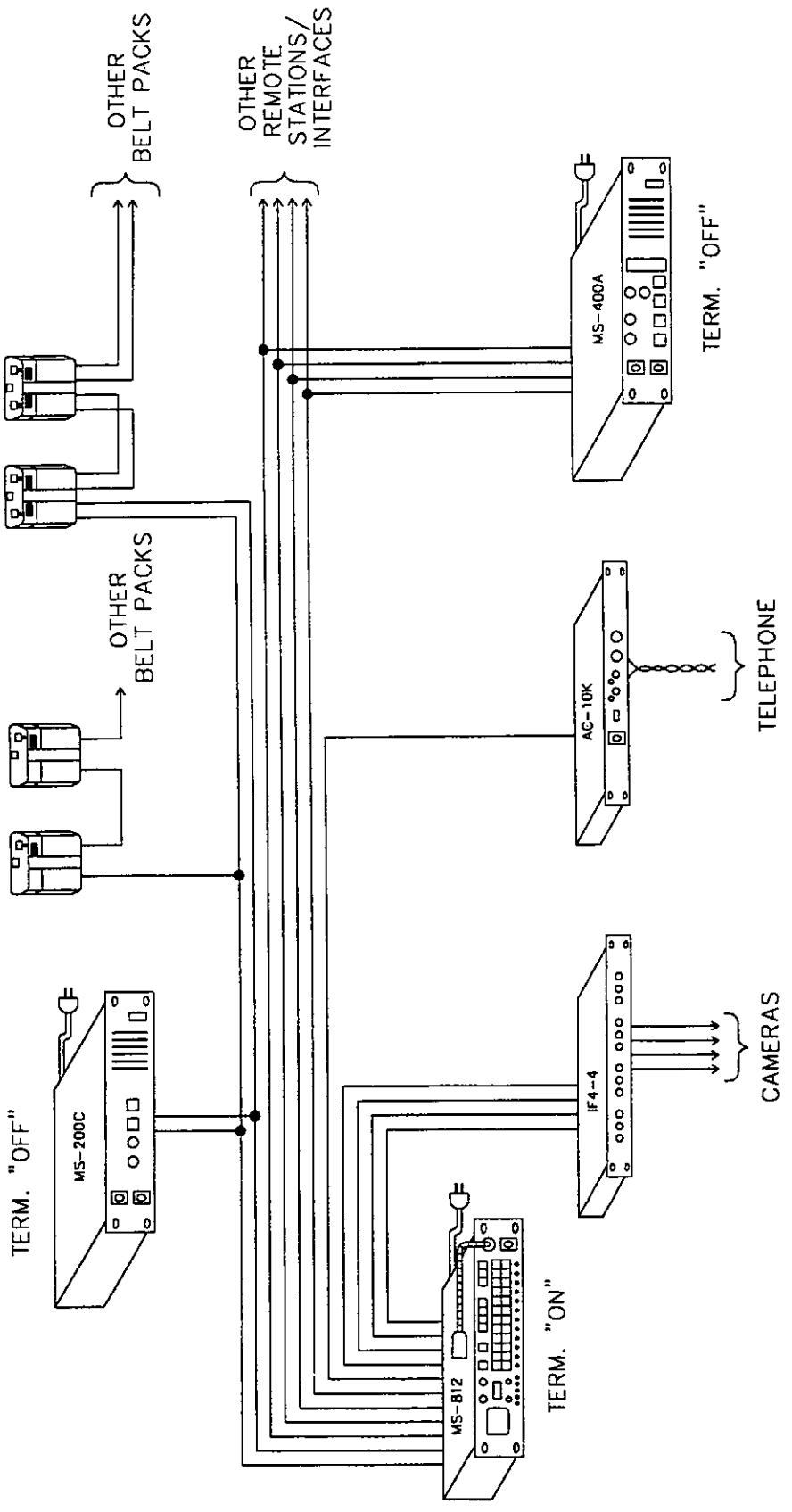



Figure 2.2
Typical XLR System Connection

## 2.2 CONNECTION OF INTERCOM LINES

Section 2.2 only deals with intercom system connection through the use of the three optional connector panels available. Other audio and control connections are discussed in Sections 2.3 to 2.8.

### 2.2.1 STANDARD INSTALLATION (XLR REAR PANEL)

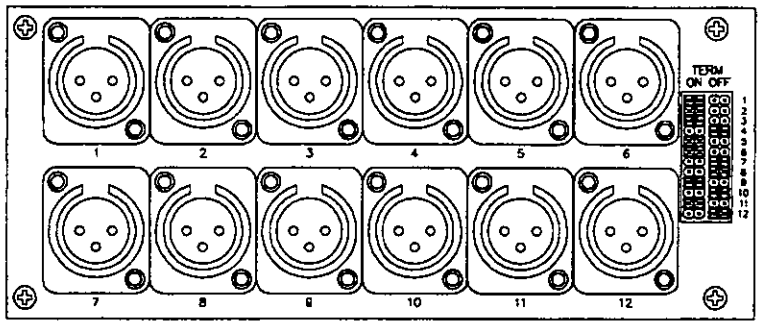



Figure 2.3
XLR Rear Panel

**12 XLR CONNECTORS:** Twelve male XLR connectors provide intercom line connection to the MS-812. The following pin-out represents only the XLR panel.

PIN-1 -- Intercom Ground (Common to all 12 connectors and intercom ground).
PIN-2 -- Intercom Power (Common to all 12 connectors only).
PIN-3 -- Intercom Audio (Twelve individual intercom lines with selectable termination on the side of the Panel).

CAUTION: The PIN-1 Ground must be isolated from chassis ground in all cases. In cable preparation be careful not to internally connect the shell of the XLR to PIN-1.

**TERMINATIONS:** Two jumper fields on the right side of the panel allow individual channel termination. The OFF connector field is provided as a "PARK" position so that the Jump-Jack will not be lost.

CAUTION: All Clear-Com Intercom lines must be terminated. Care must be taken not to 'double' terminate a line. All unused intercom inputs should be terminated to keep the line drive circuits stable.

**POWERING OF A SYSTEM EXTERNAL TO THE MS-812:** The PIN-2s of the twelve connectors are connected together. If +30 Volts DC is applied to one of the twelve connectors it will appear on the other eleven.

EXAMPLE: Connecting a Clear-Com MS-200C to channels 1 and 2 of the MS-812 will place +30 Volts on all of the PIN-2s of the XLR panel. A line of RS-501 Belt-packs will now be powered on Channel #3 from the MS-200C internal power supply. In this example the source of termination for Channels 1 and 2 could be either from the MS-812 or the MS-200C.

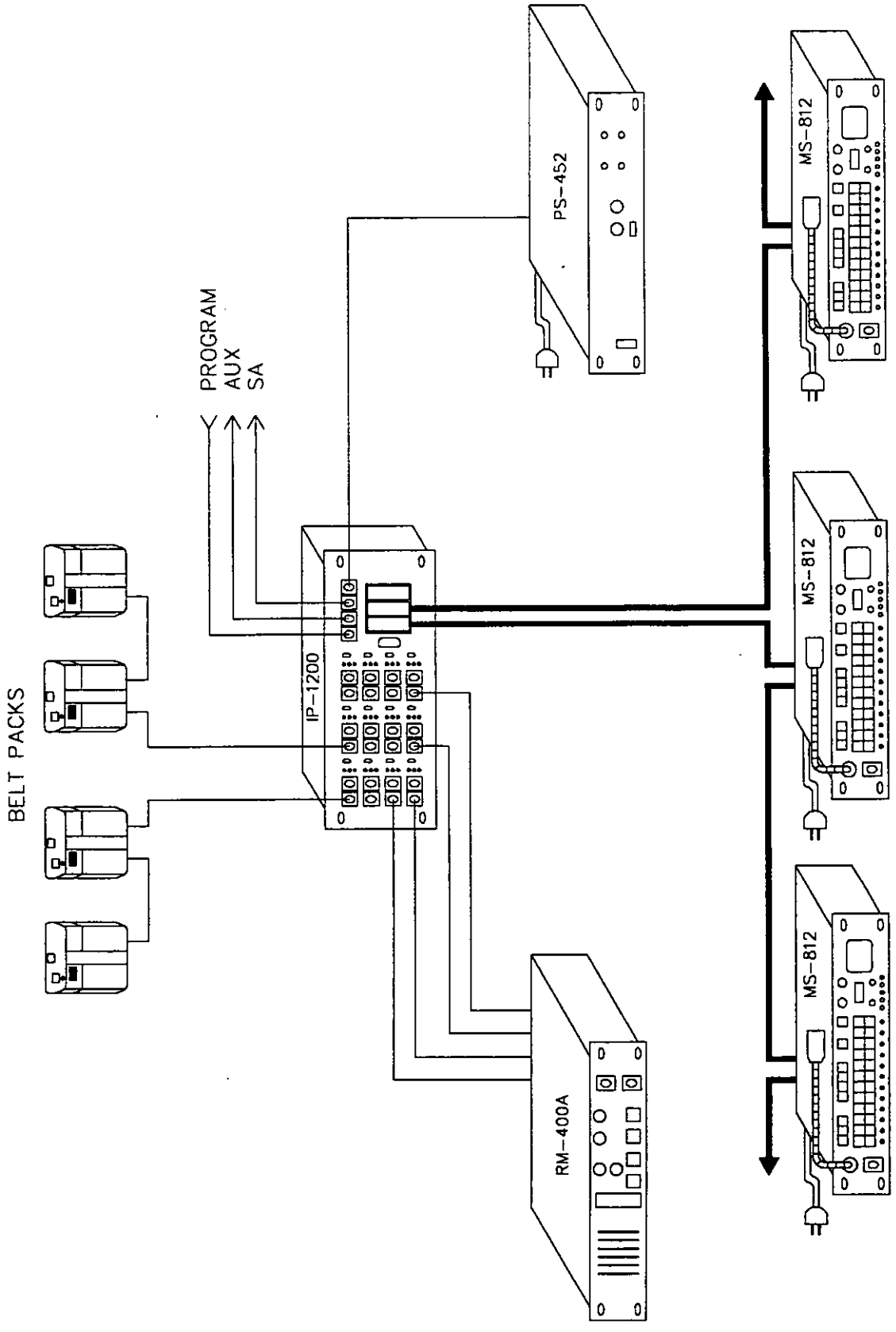



Figure 2.4
Typical ELCO System Connection

### 2.2.2 ELCO/EDAC MULTI-PAIR CABLE INSTALLATION (CP-56)

Through the use of the ELCO series 8016 56 pin cable connector, easy connection between multiple MS-812s and other system components can be quickly realized. The brand name 'EDAC' is a second source for ELCO products. The IP-1200 System Interface Panel is designed specifically to mate with the MS-812 using this cable format.

**A STAND ALONE MS-812 SYSTEM:** An 12 channel intercom system, with many MS-812s, could be easily configured using just the 16 pair ELCO cables. Daisy-chaining is quickly accomplished with the loop-through connectors on the CP-56. Termination would need to be placed in a blank connector at one of the end stations in the daisy-chain path. An ELCO connector with solder terminals could be used to construct the 12 termination networks necessary. Each MS-812 provides its own power so no power distribution is necessary.

**TWO ACCESSORY XLR CONNECTORS:** It will be noted that there are also two XLR connectors on the CP-56 option panel. These two connectors are intended for local feed of up to two channels of intercom from any MS-812. Removal of the CP-56 panel will reveal that the two connectors are jumper connected to channels 1 and 2 of the system. Easy reassignment of these XRL connectors is accomplished by moving the jumpers to the desired channel. No power is available on these connectors for operating a remote station. A two channel main station (CS-210) or power supply (PS-20) would easily provide this function.

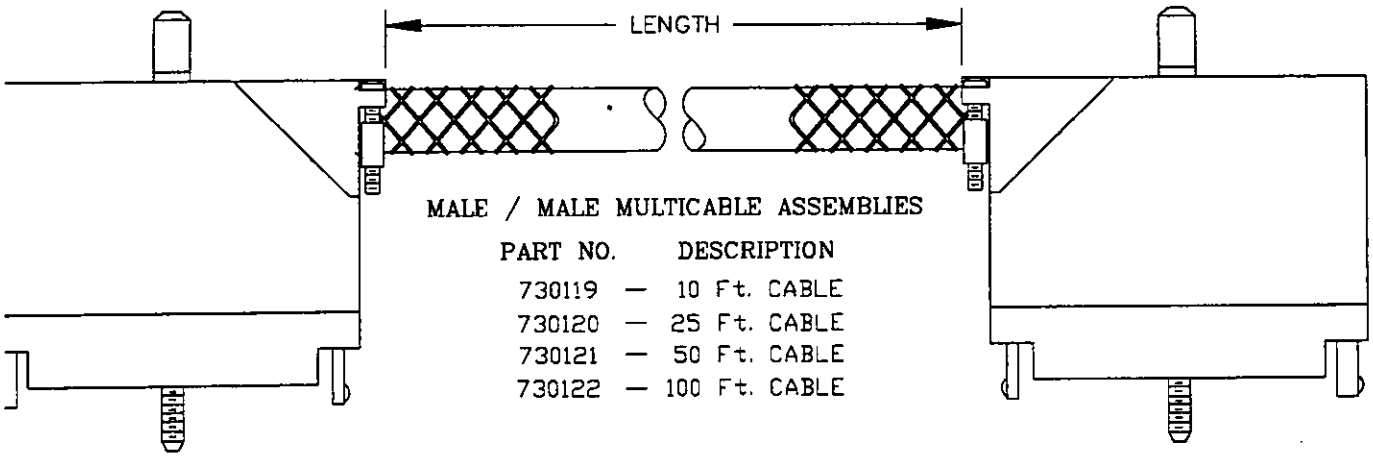
**16 PAIR CABLE FEATURES:** This 16 pair cable scheme provides a path for a number of system signals:

- -- 12 Intercom Lines
- -- System SA Feed
- -- System Program Feed
- -- System Wide Control of 4 Global Relays located in the IP-1200

**IP-1200 SYSTEM INTERFACE PANEL:** The IP-1200 provides a number of functions necessary to tie a system together:

- -- Two XLR-3M connectors per channel providing multiple feeds to external intercom components.
- -- Switchable line terminations for each of the twelve intercom lines.
- -- A single XLR connector provides input from an external power supply for distribution of DC power to the XLR connectors with individual circuit breakers for each channel. Each channel also has power GOOD and FAULT LEDs per channel.
- -- A transformer isolated XLR-3F input of Program for distribution to all MS-812s.
- -- A transformer isolated XLR-3M output of a common SA bus from all MS-812s.
- -- 4 sets of Form-C contacts of relays that can be controlled by any MS-812.

**DESCRIPTION OF 16 PAIR ELCO CABLES:** Clear-Com provides a variety of lengths of these 16 pair cables already assembled. Custom lengths can be assembled to customer order. Please contact your dealer or the Clear-Com sales department for more information. Figure 2.x on page 2-8 describes these cables.

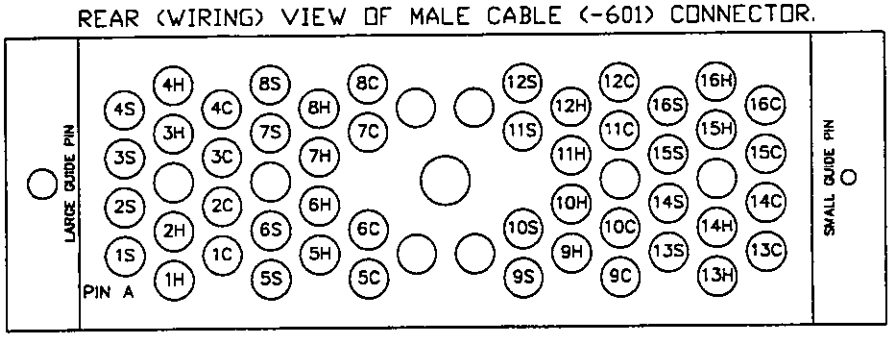



MALE / MALE MULTICABLE ASSEMBLIES

| PART NO. | DESCRIPTION |
|---|---|
| 730119 | — 10 Ft. CABLE |
| 730120 | — 25 Ft. CABLE |
| 730121 | — 50 Ft. CABLE |
| 730122 | — 100 Ft. CABLE |

CONNECTOR COVERS = EDAC # 516-230-556
MALE CONNECTOR = ELCO # 00-8016-056-000-601
CRIMP CONTACT = ELCO # 60-8017-0323

REAR (WIRING) VIEW OF MALE CABLE (-601) CONNECTOR.


LARGE GUIDE PIN
4S 4H 4C 8S 8H 8C 12S 12H 12C 16S 16H 16C
3S 3H 3C 7S 7H 7C 11S 11H 11C 15S 15H 15C
2S 2H 2C 6S 6H 6C 10S 10H 10C 14S 14H 14C
1S 1H 1C 5S 5H 5C 9S 9H 9C 13S 13H 13C
PIN A
SMALL GUIDE PIN

CABLE EXITS FROM THIS END

| WIRE | COLOR | ASGMT |
|---|---|---|
| 1H | RED | INT. #1 |
| 1C | BLK | G. RELAY #1 |
| 2H | WHT | INT. #2 |
| 2C | BLK | G. RELAY #2 |
| 3H | GRN | INT. #3 |
| 3C | BLK | G. RELAY #3 |
| 4H | BLU | INT. #4 |
| 4C | BLK | G. RELAY #4 |
| 5H | YEL | INT. #5 |
| 5C | BLK | – |
| 6H | BRN | INT. #6 |
| 6C | BLK | – |
| 7H | ORG | INT. #7 |
| 7C | BLK | – |
| 8H | WHT | INT. #8 |
| 8C | RED | – |

| WIRE | COLOR | ASGMT |
|---|---|---|
| 9H | GRN | INT. #9 |
| 9C | RED | – |
| 10H | BLU | INT. #10 |
| 10C | RED | – |
| 11H | YEL | INT. #11 |
| 11C | RED | – |
| 12H | BRN | INT. #12 |
| 12C | RED | – |
| 13H | ORG | PRG. #1 |
| 13C | RED | PRG #2 |
| 14H | WHT | – |
| 14C | GRN | – |
| 15H | BLU | SA |
| 15C | GRN | – |
| 16H | YEL | – |
| 16C | GRN | – |

Figure 2.5
ELCO/EDAC Cable Descriptions

### 2.2.3 TUCHEL MULTI-PAIR CABLE INSTALLATION (CP-30)

This option provides two 30 pin Tuchel male connectors (in parallel) wired "pin-for-pin" compatible with Clear-Com's MS-808. This option allows an MS-808 installation to expand using MS-812s. All functions that are provided in the Tuchel from the MS-808 is available in the MS-812s. The next page (2-10) shows a block diagram of a typical system.

MS-812s connected together with this cable style can communicate to each other regardless of the presence of MS-808s or without the need of a system power supply.

The following chart is the pin assignment of the Tuchels:

| | | |
|---|---|---|
| A1 - INTERCOM-1 | B1 - + 30 Volts | C1 - N/C |
| A2 - INTERCOM-2 | B2 - + 30 Volts | C2 - IFB-4A/IFB-4B |
| A3 - INTERCOM-3 | B3 - INTERCOM-10/IFB-2A | C3 - PROGRAM 1 |
| A4 - INTERCOM-4 | B4 - INTERCOM-11/IFB-3A | C4 - PROGRAM 1 |
| A5 - INTERCOM-5 | B5 - INTERCOM-12/IFB-4A | C5 - PROGRAM 2 |
| A6 - INTERCOM-6 | B6 - IFB-1A/IFB-1B | C6 - PROGRAM 2 |
| A7 - INTERCOM-7 | B7 - IFB-2A/IFB-2B | C7 - N/C |
| A8 - INTERCOM-8 | B8 - IFB-3A/IFB-2B | C8 - N/C |
| A9 - INTERCOM-9/IFB-1A | B9 - N/C | C9 - N/C |
| A0 - GROUND | B0 - GROUND | C0 - GROUND |

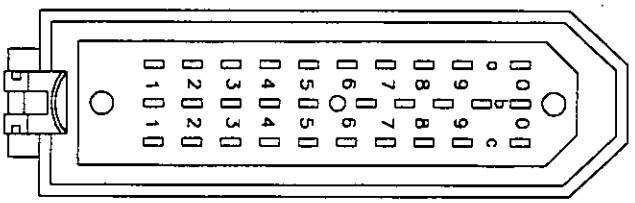


Figure 2.6 30 Pin Male Tuchel Connector Viewed From Inside Chassis

**OPTIONAL CONNECTION OF THE TUCHEL OPTION:** Pins 9A, 3B, 4B, and 5B show an optional purpose. By placing the header connected to these pins on J24 for Intercom 9-12 or J25 for IFB-A these options can be implemented. Pins 6B, 7B, 8B, and 2C also have a dual purpose. The header for these pins is intended to plug into J25 or J26. See Figure 2-14 on Page 2-16 for location of these headers. For more information refer to the schematic diagram of the Tuchel option in Chapter 7.

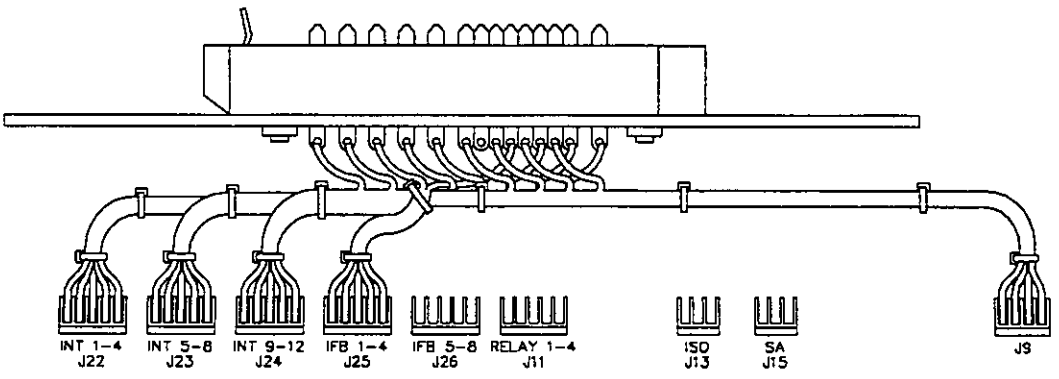



Figure 2.7 Tuchel Option Wiring Diagram

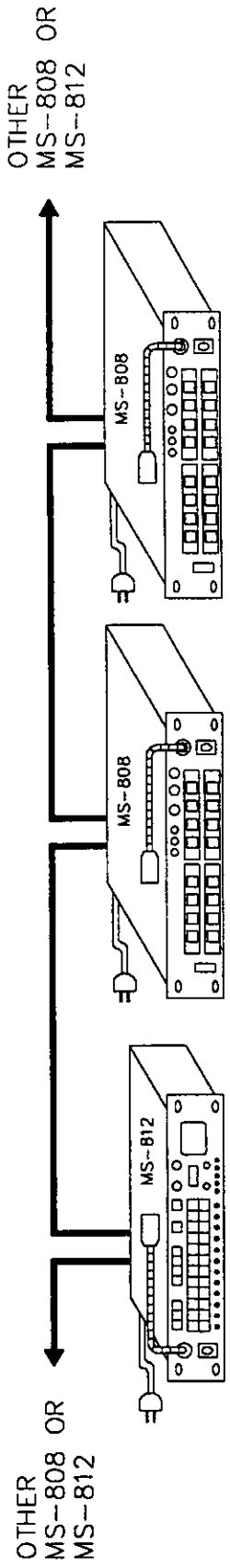



Figure 2.8
Typical Tuchel System Connection

## 2.3 MISCELLANEOUS AUDIO CONNECTIONS

There are several other connectors on the rear panel. Each of these connectors have a special purpose.

### 2.3.1 PROGRAM INPUT #1

The female XLR marked PGM-1 is a balanced program input that can be fed to the intercom lines with optional interrupt. An internal jumper (J32) also allows this program input to feed the speaker and headphones through the front panel PROGRAM control.

The input impedance is 10 K ohms balanced.

| | |
|---|---|
| PGM-1 Pinout | Pin-1 -- Ground |
| | Pin-2 -- Program Input High |
| | Pin-3 -- Program Input Low |

### 2.3.2 SA OUTPUT

The male XLR marked SA is the local Stage Announce output for the station. This output is transformer isolated. The output level is -8 dBv at 600 ohms.

| | |
|---|---|
| SA Pinout | Pin-1 -- Ground |
| | Pin-2 -- SA Output High |
| | Pin-3 -- SA Output Low |

### 2.3.3 EXTERNAL SPEAKER CONNECTION

The 1/4 inch phone jack marked EXTERNAL SPEAKER provides rear panel access to the speaker power amplifier. The internal speaker is connected to normally closed contacts in the jack. Plugging into the jack will disable the internal speaker. The output will drive an 8 ohm speaker.

| | |
|---|---|
| Jack Connections: | Tip ------- Speaker Out |
| | Sleeve -- Speaker Common |

### 2.3.4 MA-4 INTERRUPT (LINK) CONNECTION

The 1/4 inch phone jack in the lower right corner of the rear panel marked MA-4 INTRPT is the MA-4 Link Output allowing a MA-4N to share the use of the panel microphone of the MS-812. Pressing an IFB button on an external IFB control panel located close by (usually mounted just above the MS-812) will generate a control signal causing the MS-812 to interrupt what it is doing and provide an audio feed to the MA-4N.

| | |
|---|---|
| Jack Connections: | Tip ------- Microphone Preamp Out |
| | Ring ----- Control Signal (Aprox. 15 VDC) |
| | Sleeve -- Common Ground |

### 2.3.5 DB-15 AUXILIARY AUDIO CONNECTIONS

The DB-15F connector on the right end of the rear panel provides three auxiliary audio input and outputs.

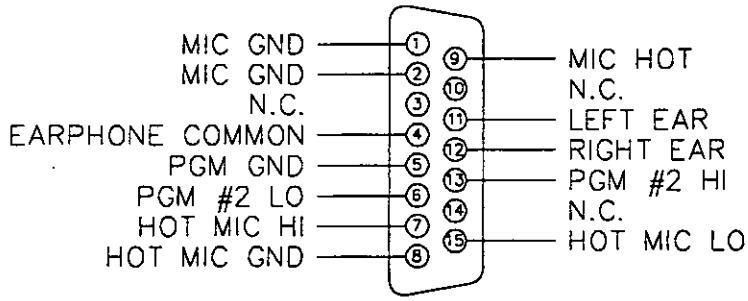



Figure 2.9 DB-15 PINOUT

**2.3.5.1 PROGRAM INPUT #2** A second PROGRAM INPUT is available on the DB-15. This input only feeds the speaker and headphone outputs whereas PGM #1 is intended for program feed to intercom lines.

**2.3.5.2 HOT-MIC OUTPUT** The HOT MICROPHONE output is a continuous feed from the microphone pre-amplifier output. The output level is -8 dBv into 600 ohms.

**2.3.5.3 STEREO HEADSET CONNECTION** The DB-15 also contains a Stereo Headset Output. The Microphone input and the Left earphone output are paralleled to the front panel headset connector.

Normally the Left headphone contains program and intercom audio. For stereo operation it is desirable to split the feed to the headphones. The Right ear only contains Program. Removal of jumper J34 allows disabling of program to the Left ear. See figure 2-14 on page 2-16 for location of J34 on the main PCB.

## 2.4 DB-9 LOGIC CONNECTOR (LOCAL RELAYS and FOOT SWITCH)

A DB-9F on the left end of the rear panel marked RELAY FOOTSWITCH provides the contacts of two LOCAL relays that are under program control and the FOOTSWITCH input. The following diagram shows the pinout of the connector.

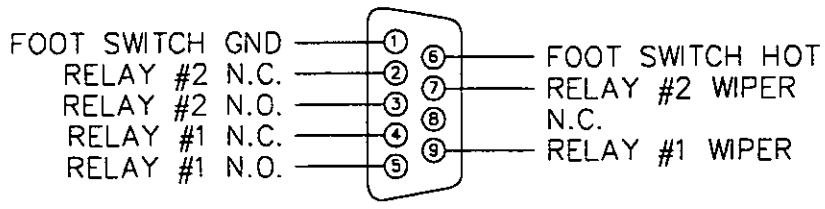



Figure 2-10 DB-9F PINOUT

The relay contacts are Form C and rated at 1 Amp at 30 VAC.

The Footswitch input is a logic input used by the program as another PRESET. An input is a contact closure between this input and logic ground. The input is normally pulled up to +5 VDC.

## 2.5 CONNECTION TO IFB (PIC-4000) SYSTEM

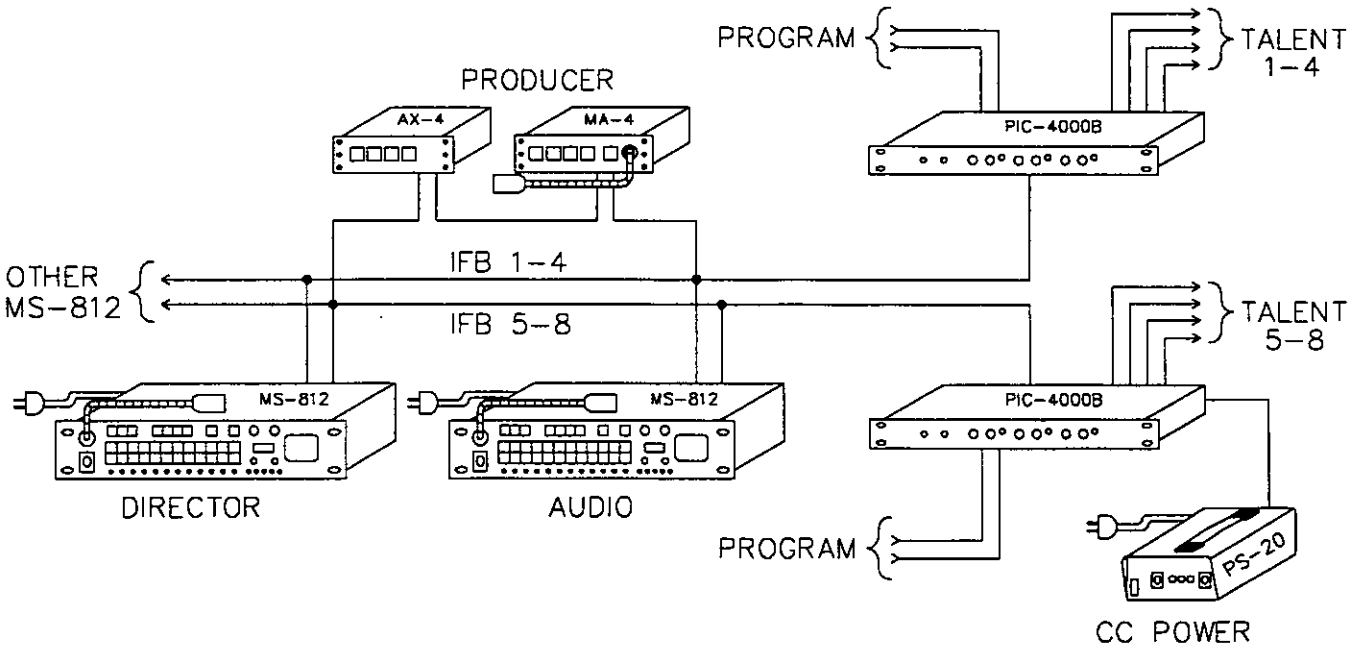
Unless ordered with one of the options listed below the MS-812 is shipped with a blank plate over holes for four XLR connectors. The ISO-16 Option provides two XLR-6M IFB connectors for eight channels of IFB and two other XLRs for ISO system connection. For each four channels of IFB the unit also needs a 4 CH Line Drive Module installed. The following is a description of the options available.

**ISO-16** -- is an option that provides just the rear panel connectors installed for IFB and ISO operation. (No additional Line Driver Modules)

**IFB-40** -- is a four channel IFB and ISO Option that has one additional Line Driver module and the rear panel connectors (ISO-16 Option) installed for IFB and ISO operation.

**IFB-80** -- is a eight channel IFB and ISO Option that has two additional Line Driver modules and the rear panel connectors (ISO-16 Option) installed for IFB and ISO operation.

With the above mentioned hardware installed and an external IFB system installed the final implementation of IFB is dependent on software configuration of the unit. Refer to Chapter 4.6.19 for information on configuring the software for IFB. Once configured the MS-812 will directly control the PIC-4000 IFB system allowing the MS-812 to emulate a MA-4 and AX-4 installation.




Typical IFB Installation Figure 2-11

## CONSTRUCTION OF SIX-PIN IFB / ISO CABLES

The diagram in Figure 2-12 will help in constructing the six-pin cable. We recommend a cable with 4 shielded pairs of 22 gauge wire. The cable should have low DC resistance (less than 15 ohms per 1000 feet). This cable wiring can be used for both IFB and ISO service.

IFB Connector Pinout

Pin-1 -- Ground
Pin-2 -- +30 VDC (unused by MS-812)
Pin-3 -- IFB Ch 1
Pin-4 -- IFB Ch 2
Pin-5 -- IFB Ch 3
Pin-6 -- IFB Ch 4

The recommended cable is a 4 pair shielded cable.

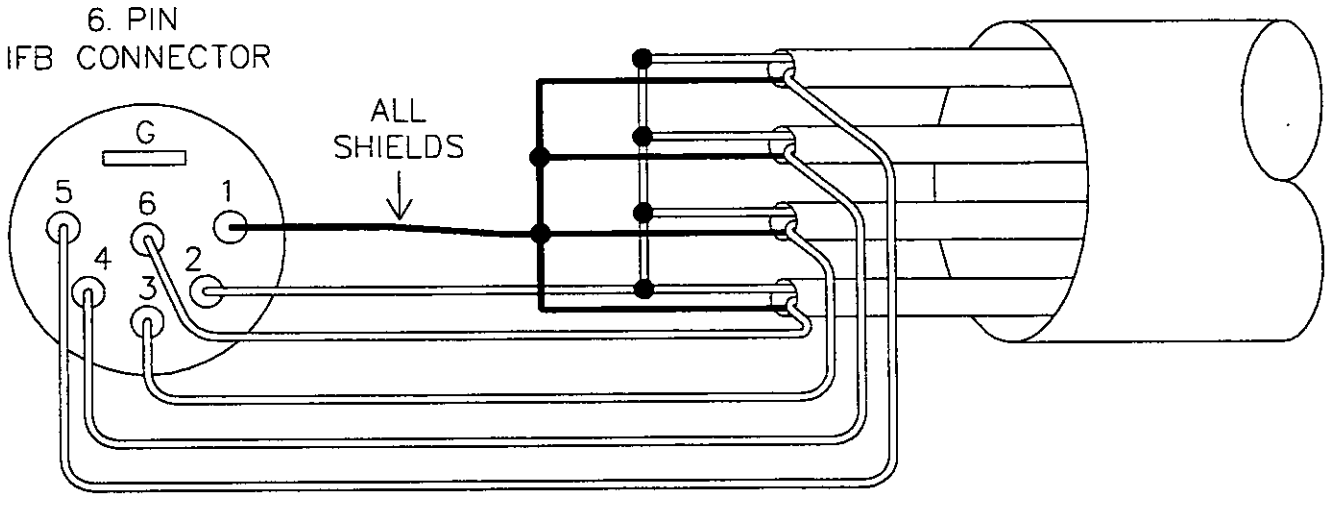



Figure 2-12 6-PIN IFB CABLE WIRING DIAGRAM

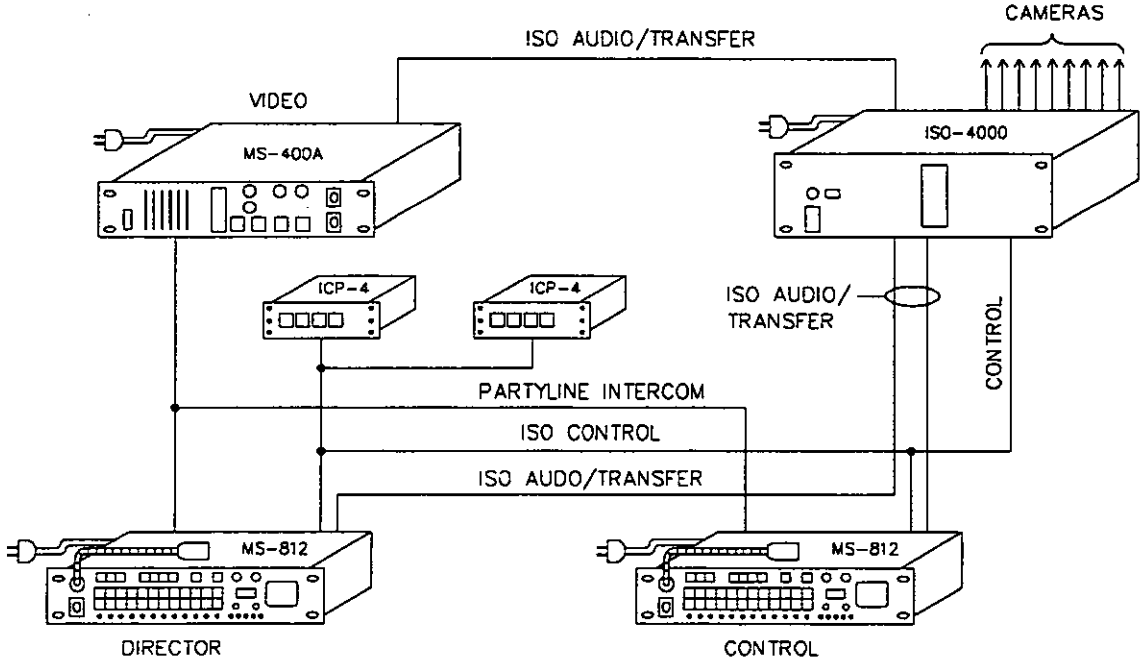
## 2.6 CONNECTION TO ISO-4000 SYSTEM

Unless ordered with one of the options listed below the MS-812 is shipped with a blank plate over holes for four XLR connectors. The ISO-16 Option provides two XLR-6M IFB connectors for eight channels of IFB and two other XLRs for ISO system connection. The ISO connectors provided are one XLR-6M (ISO Control) and one XLR-3M (ISO Audio). The following is a description of the options available. No extra Line Driver modules are necessary for ISO operation. Once configured the MS-812 will directly control the ISO-4000 ISO system allowing the MS-812 to emulate a up to four ICP-4 control modules. The XLR-3M connector provides a control signal from the ISO-4000 causing a audio interrupt in the MS-812 placing it in an isolated conversation through the ISO system.

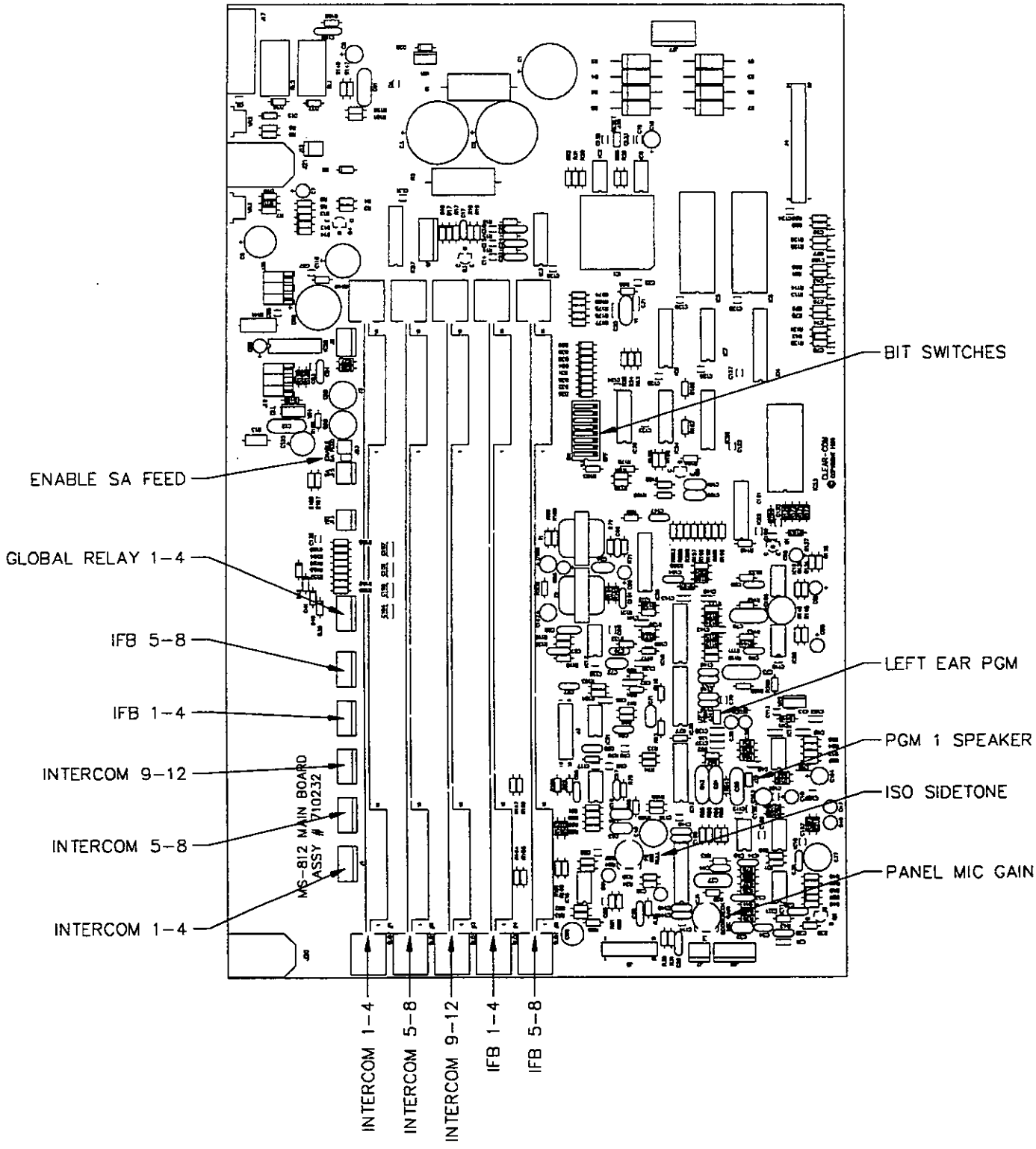
**ISO-16** -- is an option that provides just the rear panel connectors installed for IFB and ISO operation.

**CABLING** For ISO control use a 6-pin XLR cable wired as for IFB (see previous page). For ISO Audio use a single pair shielded cable identical to that used for Clear-Com intercom lines.

| | |
|---|---|
| ISO Connector Pinout | Pin-1 -- Ground<br>Pin-2 -- +30 VDC (unused by MS-812)<br>Pin-3 -- Serial Data from MS-812<br>Pin-4 -- Serial Clock from ISO-4000<br>Pin-5 -- Serial Data from ISO-4000<br>Pin-6 -- Reset Signal from ISO-4000 |
| ISO Audio Connector Pinout | Pin-1 -- Ground<br>Pin-2 -- Interrupt Control (+15 VDC Signal)<br>Pin-3 -- ISO Audio |




Typical ISO Installation Figure 2-13




Location of Main Board Option Switches and Jumpers
Figure 2-14

## 2.7 INTERNAL OPTIONS

There are a number of internal option switches and jumper located on the main PCB in the MS-812. To access these jumpers and switches remove the top cover of the unit. Refer to the diagram on the previous page for location of these options.

### 2.7.1 OPTIONAL PROGRAM #1 FEED TO SPEAKER (Default - ON)

As shipped from the factory Program #1 input will feed both Intercom program feed and Program listen on the Speaker and Headphones. If a second program feed is used (available on the DB-15 connector) remove the jump jack on J32 to remove Program #1 from the Speaker and Headphone feed.

### 2.7.2 OPTIONAL PROGRAM FEED TO LEFT EAR (Default - ON)

As shipped form the factory the MS-812 is intended for use with a Monaural headphone through the front panel headphone jack. If a stereo headphone is connected through the DB-15, it is usually desirable that Intercom be in one ear while Program be in the other. Remove the jump jack on J34 to remove program from the left ear.

### 2.7.3 OPTIONAL GLOBAL SA FEED TO ELCO/EDAC CONNECTORS (Default - OFF)

If the ELCO multi-pair cable rear panel connector option is used the SA signal would be available in that cable. The SA feed to this cable must be enabled using jumper J33. As this line is a bridging bus similar to Clear-Com intercom lines it needs to be terminated.

As shipped from the factory a jump jack is connected between pins 1 and 2 placing a termination on the line driver and removing the feed from the ELCO cable. To enable this function remove the jump jack from pins 1 and 2, and place it on pins 2 and 3.

### 2.7.4 DIP SWITCH PROGRAM OPTIONS (Default - ALL OFF)

The microprocessor program for the MS-812 has several options that are selectable by the user. As shipped from the factory all DIP switches are placed in the off position. The following chart shows the basic purpose of the switches:

| | | |
|---|---|---|
| 1. MULTIPLE SETUP ENABLE | OFF-Disabled | ON-Enabled |
| 2. MENU LEVEL SELECT | OFF-Basic | ON-Extended |
| 3. BUTTON LOCK (Menu) ON/OFF | OFF-Disabled | ON-Enabled |
| 4. IFB MENU ENABLE (PIC-4000) | OFF-Disabled | ON-Enabled |
| 5. ISO MENU ENABLE (ISO-4000) | OFF-Disabled | ON-Enabled |
| 6. not used | | |
| 7. REVERSE TALK/LISTEN | OFF-Normal | ON-Reverse |

8. FACTORY TEST - **MUST BE IN OFF POSITION**
   Unit will appear to malfunction if **ON**.

DIP switches 3 - 5 only affect the availability of the respective menus however the actual function could operate if the particular program option had been set before the DIP switch is placed in the off position.

Example: With DIP SW #3 in the ON position, certain front panel buttons could be set permanently ON. The DIP SW could then be set to OFF but the particular buttons would be locked ON but the user could not change it.

An internal DIP Switch option allows the reversal of the TALK and LISTEN buttons on the front panel. DIP SW #7 places the LISTEN buttons on the bottom row and the TALK buttons on the top row. All programmed options will track their appropriate buttons.

Channel number assignment for IFB and ISO are also swapped. Channel #1 would now be on the bottom row. (Section 4.6.19 explains the normal channel numbering scheme.) The same examples in the REVERSE mode are as follows:

| | | | |
|---|---|---|---|
| 2 | 3 4 | 4 5 6 | 5 6 7 8 |
| 1 | 1 2 | 1 2 3 | 1 2 3 4 |

## 2.8 CONNECT MS-812 INTERCOM STATION TO A SOURCE OF A.C. POWER

The Station is typically shipped configured for the country of installation. The internal 110/220 VAC switch (located inside the chassis) allows configuration for locally available line voltage.

To access the internal 110/220 VAC switch, unplug the AC power cord. Then, unscrew and remove the top cover of the Intercom Station. The switch is located on top of the AC connector block inside the chassis and is labeled "110/220."

**THE FUSE MUST BE CHANGED:** --110V uses 0.5A slow-blow
--220V uses 0.25A slow-blow

Remember to also replace the original spare fuse (located in the fuse holder) with one that matches the voltage setup.

Plug the power cord extending from the Intercom Station's rear panel into a source of AC power.

# SECTION 3
# SETUP & ADJUSTMENT OF THE MS-812 PROGRAMMABLE MASTER INTERCOM STATION

## 3.1 INTERNAL OPTIONS

There are a number of internal option switches and jumper located on the main PCB in the MS-812. To access these jumpers and switches remove the top cover of the unit. Refer to the diagram on the page 2-16 for location of these options.

### 3.1.1 OPTIONAL PROGRAM #1 FEED TO SPEAKER (Default - ON)

As shipped from the factory, Program #1 input will feed both Intercom program feed and Program listen on the Speaker and Headphones. If a second program feed is used, (available on the DB-15 connector) remove the jump jack on J32 to remove Program #1 from the Speaker and Headphone feed.

### 3.1.2 OPTIONAL PROGRAM FEED TO LEFT EAR (Default - ON)

As shipped form the factory the MS-812 is intended for use with a monaural headphone through the front panel headphone jack. If a stereo headphone is connected through the DB-15, it is usually desirable that Intercom be in one ear while Program be in the other. Remove the jump jack on J34 to remove program from the left ear.

### 3.1.3 OPTIONAL GLOBAL SA FEED TO ELCO/EDAC CONNECTORS (Default - OFF)

If the ELCO multi-pair cable rear panel connector option is used, the SA signal would be available in that cable. The SA feed to this cable must be enabled using jumper J33. As this line is a bridging bus similar to Clear-Com intercom lines it needs to be terminated. As shipped from the factory a jump jack is connected between pins 1 and 2 placing a termination on the line driver and removing the feed from the ELCO cable. To enable this function remove the jump jack from pins 1 and 2, and place it on pins 2 and 3.

### 3.1.4 DIP SWITCH PROGRAM OPTIONS (Default - ALL OFF)

The microprocessor program for the MS-812 has several options that are selectable by the user. As shipped from the factory all DIP switches are placed in the off position. The following chart shows the basic purpose of the switches:

| | | |
|---|---|---|
| 1. MULTIPLE SETUP ENABLE | OFF-Disabled | ON-Enabled |
| 2. MENU LEVEL SELECT | OFF-Basic | ON-Extended |
| 3. BUTTON LOCK (Menu) ON/OFF | OFF-Disabled | ON-Enabled |
| 4. IFB MENU ENABLE (PIC-4000) | OFF-Disabled | ON-Enabled |
| 5. ISO MENU ENABLE (ISO-4000) | OFF-Disabled | ON-Enabled |
| 6. not used | | |
| 7. REVERSE TALK/LISTEN | OFF-Normal | ON-Reverse |
| 8. FACTORY TEST - **MUST BE IN OFF POSITION** Unit will appear to malfunction if **ON**. | | |

Example: With DIP SW #3 in the ON position, certain front panel buttons could be set permanently ON. The DIP SW could then be set to OFF but the particular buttons would be locked ON but the user could not change it from the front panel.

### 3.1.5 AC VOLTAGE SELECTION

The Station is typically shipped configured for the country of installation. The internal 110/220 VAC switch (located inside the chassis) lets you reconfigure for the local line voltage.

To access the internal 110/220 VAC switch, unplug the AC power cord. Then, unscrew and remove the top cover of the Intercom Station. The switch is located on top of the AC connector block inside the chassis and is labeled "110/220."

You also must change the fuse: --110V uses 0.5A slow-blow
--220V uses 0.25A slow-blow

Remember to also replace the original spare fuse (located in the fuse holder) with one that matches your setup.

## 3.2 INTERNAL ADJUSTMENTS

There are very few internal adjustments in the MS-812.

### 3.2.1 PANEL MICROPHONE GAIN TRIM

The Panel Microphone gain can be adjusted for a particular person or environment that the station is being used. In a high noise environment the gain should be set low causing the operator to work the microphone closely and thereby reducing the influence of background noise. Some installations require that the operator work the microphone from a distance, in this case the gain should be set high.

The gain of the microphone preamplifier is adjustable when it is switched to the Panel Microphone. Potentiometer, P1, allows a +/- 5 dB adjustment in gain. See figure 3-1 for location of this control.

### 3.2.2 INTERCOM LINE NULL (SIDETONE) ADJUSTMENT

**SIDETONE** is the amount you hear yourself in your own headset. In headsets a controlled amount of sidetone is desirable for assurance that the microphone is on. Sidetone in a speaker can cause feedback and is not desirable.

The MS-812 has a front panel SIDETONE control that sets the amount of LOCAL sidetone heard in the headphone.

The Line Driver circuitry consists of a hybrid null circuit that attempts to reject all of the TALK signal being sent to the intercom line. The rejection (NULL) circuit compares the intercom line with the send (TALK) signal. The balance of this circuit depends on the impedance of the intercom line to be stable. The NULL adjustment control compensates for variations in line impedance due to various amounts of cable and numbers of stations on the line. A mis-adjusted NULL control on a line driver will cause extra sidetone in the headphone that is not controllable on the front panel. The ideal setup is to have no sidetone from the line driver, therefore the only sidetone heard is that inserted by the front panel trim control. Excessive sidetone in the speaker will cause feedback.

(continued)

**NULL ADJUSTMENT OF LINE DRIVERS:** Each intercom Line Driver circuit has a NULL control allowing it to be matched to impedance of the particular intercom line it is connected to. As shipped from the factory, the NULL control has been set for a Clear-Com line of 200 feet which will produce acceptable results for lines from 0 to 500 feet. For optimum results with these short lines or use of longer lines follow the following procedure for NULL trimming:

1. Remove the top cover of the MS-812.
2. Turn the LOCAL SIDETONE trim control on the front panel fully off.
3. Make sure that the line to be nulled to is configured as it will be in normal use including termination.
3. With the front panel pushbuttons, set a TALK and LISTEN only to the channel being nulled.
4. Using a headset, talk into the microphone and listen to the sidetone in the headphone.
5. Adjust the NULL control for the particular channel for a minimum sidetone (null). Refer to figure 3-2 for location of the controls. Only the twelve intercom channels need to be nulled. The IFB Line Drivers only drive the line and the listen circuits are not used. Select another channel and repeat the procedure.
6. If an ISO system is installed the ISO null control will also need adjustment. Using a front panel button that has been programmed for ISO, activate ISO such that the sidetone from the ISO line can be heard in the headphone. Adjust the ISO null control for minimum sidetone. Refer to figure 3-2 for location of this control.

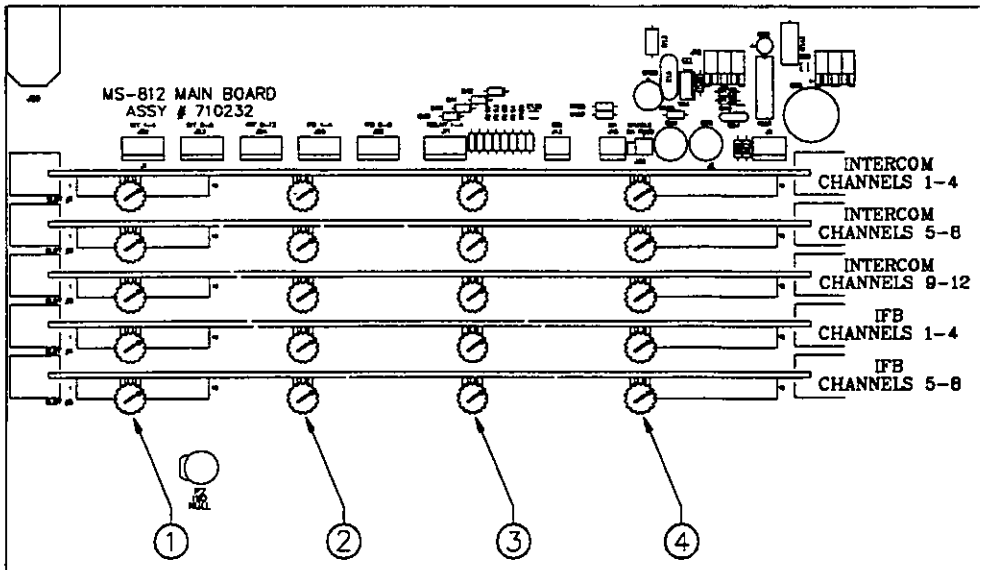



Figure 3.1 Null Adjustment of Line Drivers

## SECTION 4 / OPERATION OF THE MS-812 PROGRAMMABLE MASTER INTERCOM STATION

The MS-812 is a multi-channel intercom station with the exact function of front panel controls being definable by the user. As shipped from the factory, all programming options are set for default settings. With default settings the station will function as a simple 12 channel intercom. Special functions such as IFB, ISO, and RELAY activation will need to be programmed.

**SETUP MEMORY:** The configuration or SETUP of the station is saved in NVM (Non-Volatile Memory) such that the SETUP is saved during power-down. There are four complete setups saved. Each SETUP is a complete personality for the machine.

**KEY ACTION:** All illuminated buttons are dual action. If pressed for a short period of time (less than 1/4 second) the button will "LATCH" when released. If pressed longer, the button will be momentary. The button is solid illuminated when the function is on. Latching action can be disabled on certain buttons through the LATCH DISABLE function in the programming mode.

**BUTTON FUNCTION TYPE:** Because the station is programmable the fundamental way a button works can be different. Besides the special function buttons such as MIC ON, PANEL MIC ON, SPKR ON, CALL, and SA, the buttons can be programmed to five distinct types of functions: (NOTE: Because the 24 selector buttons "default" to intercom functions, they are referred to as "TALK" and "LISTEN" buttons.)

**INTERCOM Operation:** Intercom operation is the default type for all TALK/LISTEN buttons. In INTERCOM mode the bottom row of buttons are for TALK activation and the top row are for LISTEN activation. Incoming CALL signals will flash the appropriate LISTEN button.

**IFB Operation:** TALK/LISTEN buttons can be programed to function as IFB channels directly controlling a CC PIC-4000 IFB system. In this mode the normal intercom channel that the particular button would have talked or listened to is non-functional at this station. The button only controls a TALK to a particular IFB channel and automatically sends a CALL signal activating the PIC-4000 IFB controller. IFB tally will flash the appropriate IFB channel.

The IFB function can be programmed as a PRIVATE TALK function. During PRIVATE TALK, all other intercom talk paths are momentarily disabled. The default of the IFB function allows communications on all other intercom talk paths to continue.

**ISO Operation:** TALK/LISTEN buttons can be programed to function as ISO channels thereby directly controlling a Clear-Com ISO-4000 system. In this mode the normal intercom channel that the particular button would have talked or listened to is now non-functional at this station. The button only controls a combined TALK and LISTEN directly to the ISO system. Control signals are sent to the ISO-4000 to instruct it to place a particular station on an isolated intercom path to the MS-812.

By default, the ISO function is a PRIVATE TALK function, all other TALK Paths are momentarily disabled during the ISO operation. The button can be programmed to allow communications on all other intercom talk paths to continue. (ISO Operation continued)

(ISO Operation continued)

By default, the ISO function is also a PRIVATE LISTEN Function, all other LISTEN Paths are momentarily disabled during the ISO operation. The button can be programmed for Normal Listen.

**RELAY ONLY Operation:** If a button has no other assigned purpose but has a relay assigned, it will become a RELAY ONLY button operating no other function than the relay assigned to it. If all of the Line Driver Modules are not installed and the buttons that are associated with the missing module is not programmed to ISO or IFB the button would have no purpose. It might be desirable to program such a button for just relay activation. An unassigned PRESET button will also fall into this category.

It is important to remember that buttons can be programmed to operate nothing but relays. If pressing such a button and no apparent action at the station results it must be remembered that the button may be activating a GLOBAL RELAY located some where else. A reading of the BUTTON CHECK function would reveal this operation.

**PRESET OPERATION:** The PRESET buttons are a special type of button. Normally other buttons are assigned to the PRESETs and their function is to operate those other buttons as if they were pressed. The logical action of PRESETs can be ADDITIVE or INTERLOCKING, (see PRESET button descriptions). If a preset becomes a RELAY ONLY button it will no longer follow the INTERLOCKING logic of a normal PRESET button.

**PRIORITY, PRIORITY TALLY, and PRIORITY OVERRIDE**

The major functions such as SA, IFB, ISO have a predetermined priority. Because these functions are exclusive, interrupt or replace existing station activity, they have been assigned levels of priority based on their importance. In general, priorities are logical, automatic and transparent to the operator. The priority sequence is as follows:

1. SA
2. IFB
3. ISO
4. Private Intercom Listen/Talk
5. Normal Intercom activity

EXAMPLE: If a button is set for PRIVATE TALK it will interrupt other TALKs when it is activated; however, pressing an IFB button will interrupt the PRIVATE TALK function.

Priorities are not in effect inside a PRESET or FOOTSWITCH assignment. EXAMPLE: If a button set for ISO and the SA button are both placed in the same PRESET, then both functions will operate.

PRIORITY TALLY: If a higher priority function overrides a lower level function the lower level's button will flash at a special rate (short on-long off) indicating that the function has been temporarily overridden.

PRIORITY OVERRIDE: If a button has been overridden by a higher priority function and it is desired to still TALK or LISTEN to the channel, simply press that button and the function will return.

## 4.1 LCD DISPLAY

The MS-812 features a LCD display intended to guide the user in programming the station. The rest of this text will show actual displays in the context that they apply.

**PROGRAMMING MODE:** During programming the LCD display shows the current menu item by name.

**NORMAL OPERATION:** During normal operation the display shows the current SETUP name. These names are programmable by the user (refer section 4.6.23). If during normal operation, a button is pressed that causes an error a BEEP tone will be issued and the display will show one of two messages:

| BUTTON<br>INACTIVE | BUTTON<br>LOCKED |
|---|---|

**BUTTON INACTIVE:** This error message indicates that a button was pressed that currently has no function. If the line driver module necessary to support a particular channel is not installed in the unit then this error will result. If a button is programmed for ISO and an active ISO system is not connected to the unit the same error will result. If a PRESET button has no buttons or relays assigned, the same error will result.

**BUTTON LOCKED** Pressing a key that has been locked ON or OFF, in the programming mode, will produce this error.

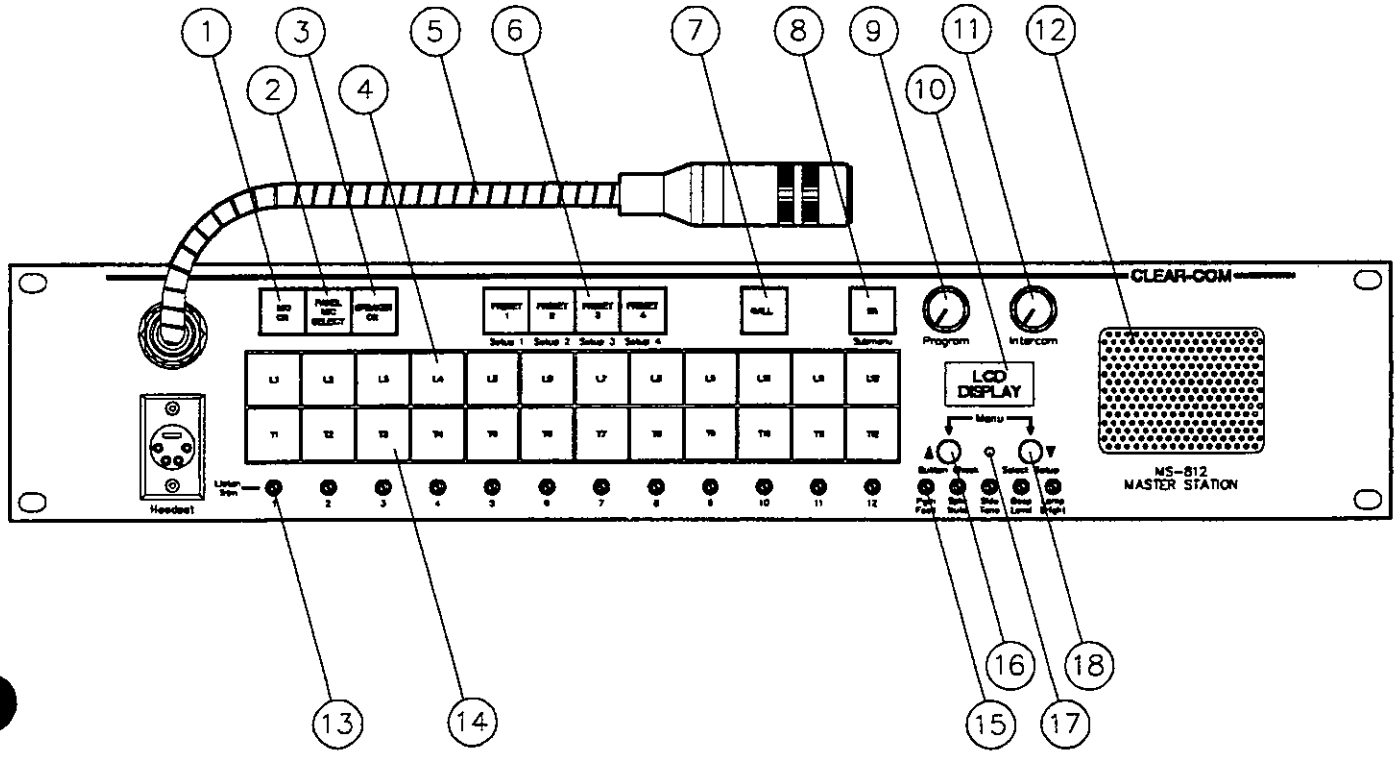



Figure 4-1 Front Panel Description

## 4.2 DESCRIPTION OF FRONT PANEL BUTTONS

Most of the front panel buttons on the MS-812 are illuminated and re-legendable. The illumination is dim for indicating OFF and bright for ON. Overall brightness is adjustable by a front panel trim control (LAMP BRIGHTNESS). In normal operation, a flashing button is a tally indication (CALL, IFB or ISO).

### 4.2.1 'MIC ON' BUTTON -- Figure 4-1 item #1

The MIC ON button turns on or off audio from the microphone pre-amp. A MIC ON condition is indicated by bright illumination of the button.

If the microphone is turned off and a TALK path is requested by other button action at the station, the microphone automatically turns on. If the function was a momentary function the microphone will return to the OFF condition when the function is released.

The MIC ON/OFF control does not affect the HOT MIC output from the station.

### 4.2.2 'PANEL MIC' BUTTON -- Figure 4-1 item #2

When a HEADSET is connected to the MS-812 the PANEL MIC button selects either the PANEL MIC or the HEADSET MIC.

Without a headset plugged into the unit the Panel microphone is always selected, the PANEL MIC button will be illuminated, and the button will not operate, (there is no HEADSET MIC to select). An illuminated button indicates Panel microphone operation.

When a headset is initially plugged into the station the microphone pre-amp is automatically switched to headset. Unplugging a headset automatically returns the unit to Panel microphone operation. When a headset is plugged in the PANEL MIC button is used to select between the two microphones.

### 4.2.3 'SPEAKER ON' BUTTON -- Figure 4-1 item #3

Without a headset plugged into the unit, the Speaker is always on and cannot be shut off. An illuminated button indicates that the speaker is on. The headset earphone is always on.

When a headset is initially plugged into the station, the speaker is automatically turned off. Unplugging a headset automatically enables the speaker.

When a HEADSET is connected to MS-812 the SPEAKER ON button enables the SPEAKER to be turned ON and OFF.

### 4.2.4 'PRESET' BUTTONS -- Figure 4-1 item #6

Four special function buttons called PRESETs can be programmed by the user to activate any combination of the 24 selector buttons and the SA button. Refer to section 4.6.1 for instructions on programming these buttons.

If a PRESET button is programmed to particular buttons, when pressed those functions will be activated just as if they were pressed all at the same time.

The logical action of the PRESET buttons is selectable in the programming mode. The choice of modes is the same for all preset buttons. Refer to Section 4.6.2.

**INTERLOCK:** If a preset is active and another preset button is pressed the second preset functions will replace the first. If the second button press is momentary in duration the original active preset will return when the second one is released. If the second preset is latching, releasing it will return the station to no preset activity.

**ADDITIVE:** In this mode multiple presets will simply add functions to what is already active. Removing a preset in this mode will only remove those functions added by that preset.

### 4.2.5 'CALL' BUTTON -- Figure 4-1 item #7

The CALL button is used to enable sending a CALL to the intercom lines (it does not directly send a CALL signal). Pressing CALL enables the CALL function and illuminates the button. Pressing a TALK key while the CALL button is illuminated will send a CALL signal on that intercom line. The CALL function will time-out and turn itself off if it is not used for 3 seconds.

### 4.2.6 'SA' BUTTON -- Figure 4-1 item #8

The SA button is used to activate the Stage Announce output of the station. If pressed in normal operation, all active TALKs will turn off and the microphone pre-amp output will be routed to the SA output. The SA button is default programmed for PRIVATE LISTEN which can be disabled if normal Listens are desired. If SA has been assigned to a PRESET button it will not affect the other TALKs and LISTENs set to the PRESET.

If a contact closure is desired when the SA button is pressed, one of the local or global relays would need to be programmed to the button.

The SA button is default programmed for LATCH DISABLE making it momentary. If desired, latching action can be restored using the Latch Disable menu in the programming mode.

### 4.2.7 'TALK' and 'LISTEN' BUTTONS -- Figure 4-1 items #4 and #14

**INTERCOM USE:** The top row (item #4) of the twenty four buttons in the middle of the station are used to turn on LISTENs to an intercom channel. The bottom row of buttons (item #14) turns on TALKs to the corresponding intercom channel.

Incoming call signals will flash the appropriate Listen button, If CALL-IN on a particular channel is enabled. As shipped from the factory all call-in signaling is enabled.

Sending of call signals is accomplished by enabling the CALL send mode with the CALL button and then pressing the appropriate TALK button.

**IFB and ISO USE:** Groups of buttons can be programmed for control of IFB or ISO channels if desired. When programmed for these functions the normal TALKs and LISTENs for the particular channel are lost to the user.

Example: If channels 11 and 12 are programmed for IFB, intercom channels 11 and 12 are no longer active at this station.

### 4.2.8 "NEXT (∇)" and "BACK (Δ)" PROGRAM BUTTONS -- Figure 4-1 items #16 and #18

The two black pushbuttons located just below the LCD display, marked "∇" (NEXT) and "Δ" (BACK) are intended primarily for programming purposes. During normal operation these buttons have special functions. The terms NEXT and BACK will be used in the following text.

#### 4.2.8.1 SELECTING SETUPS "NEXT (∇)"

In normal operation the NEXT (∇) button is used to select other system setups. Pressing and holding the NEXT (∇) button for one second brings up a special menu allowing the user to select one of the four SETUPS saved in memory. The LCD display will respond as follows:

```
Select
Setup
```

The four PRESET buttons will now flash except for the one representing the current SETUP number, which will be on steady. Pressing any of the four buttons will select that SETUP and immediately exit the mode.

Setup selection can be disabled via an internal DIP switch (refer to page 4-10).

### 4.2.8.2 BUTTON CHECK FUNCTION (BACK (Δ))

In normal operation the BACK (Δ) button is used to enable the BUTTON CHECK function. Pressing and holding the BACK (Δ) key for one second will place the system in BUTTON CHECK mode. The LCD display will respond:

```
Button
Check
```

All illuminated buttons will now flash indicating that they are available for inquiry about their status. Pressing any one of the buttons will cause the LCD display to indicate "Button Type", "Status", and then list all functions that button is programmed to. To exit a particular button check inquiry before it is finished, press the button again.

| | | | |
|---|---|---|---|
| Button Types: | INTERCOM | Status Types: | No Audio Card |
| | IFB | | No ISO System |
| | ISO | | Preset Empty |
| | PRESET | | |
| | RLY ONLY | | |

If the RESET button is pressed while in the BUTTON CHECK mode, the display will present special information about the unit. The display will sequence between three different screens:

A.

```
Software
Rev. X.X
```

Displays the Revision level of the software in the machine.

B.

```
Dip Sw.
XXXXXXXX
```

Displays the setting of the internal DIP switches. '0' = OFF '1' = ON

C.

```
Standard
Talk/Lsn
```

```
Reverse
Talk/Lsn
```

Displays the orientation of the TALK/LISTEN buttons.

#### 4.2.8.3 ACCESSING PROGRAMMING MODE

Pressing and holding NEXT (∇) and BACK (Δ) together for one second will display the word "Menu" on the screen, and cause the system to enter the programming mode. Releasing and pressing both buttons again will cause the system to access the EXTENDED MENU if enabled. Refer to section 4.5 for information on programming.

#### 4.2.8.4 STEPPING THROUGH MENUS

When the system is in the programming mode the NEXT (∇) and BACK (Δ) buttons enable stepping through the menus. Pressing and releasing NEXT (∇) steps forward in the menus while pressing and releasing BACK (Δ) steps backward in the menus. Refer to section 4.5 for information on programming.

### 4.2.9 'RESET' BUTTON -- Figure 4-1 item #17

There is a small unmarked hole between the NEXT (∇) and BACK (Δ) buttons that provides access to a RESET button. A small screwdriver can be used to depress this button. The action of the RESET button depends on the operating mode at the time.

**NORMAL OPERATION: (RESET Current SETUP)** If the RESET button is pressed during normal operation, all the buttons will flash as a warning and the LCD display will show "RESET" with a series of arrows on the bottom row progressing across the screen. After four seconds the bottom row of the screen will be filled with arrows and then the system will RESET only the current SETUP. All programmed options will be reset to DEFAULT conditions except for current setup name and ISO Station Number.

(RESET continued)

**PROGRAMMING MODE: (RESET Selected Menu Item)** If the RESET button is pressed while in the Programming Mode, the currently selected menu item will be set to its default setting.

**POWER UP RESET: (Complete Memory Clear)** If the RESET button is depressed while the AC power is turned on, the system will completely reset all four SETUPS to (Factory) Defaults. This RESET mode should only be used to totally clear the machine.

## 4.3 DESCRIPTION OF FRONT PANEL CONTROLS

### 4.3.1 PROGRAM VOLUME -- Figure 4-1 item #9

The PROGRAM VOLUME control sets the amount of external program heard in the speaker and headphones.

### 4.3.2 INTERCOM VOLUME -- Figure 4-1 item #11

The INTERCOM VOLUME control sets the overall Listen level of the intercom lines. Each of the twelve intercom lines also have a Listen level trim control located under each of the respective TALK buttons.

### 4.3.3 PROGRAM FEED Trim Level -- Figure 4-1 item #5

The PGM FEED trim control sets the amount of Program being sent to Intercom lines.

### 4.3.4 SPEAKER MUTE TRIM LEVEL -- Figure 4-1 item #15

If the Panel microphone and the Speaker are both enabled at the same time there is the possibility of feedback. During this mode the audio level to the speaker can be reduced (Muted) to prevent this feedback. The amount of reduction is set by the SPKR MUTE trim level control.

### 4.3.5 SIDETONE LEVEL TRIM (LOCAL) -- Figure 4-1 item #15

Sidetone is the portion of the local headset microphone signal that is also heard in the earphone. This effect is desirable as a confidence factor that the microphone is operating. The SIDE TONE trim control adjusts the amount of locally generated sidetone.

NOTE: Side tone can also be generated by an improperly nulled intercom line driver. The Local Sidetone Control will have no effect on this source of side tone. Refer to section 3.2.2 for sidetone null adjustment of intercom line drivers.

### 4.3.6 BEEP TONE LEVEL TRIM -- Figure 4-1 item #15

BEEP tones are generated at various times in the operation of the system. These tones are only heard in the Speaker and are not affected by the Intercom Volume control. The BEEP tone is only affected by the SPEAKER ON/OFF button and the BEEP LEVEL trim control. Adjust the BEEP LEVEL trim control for desired level.

### 4.3.7 LAMP BRIGHTNESS -- Figure 4-1 item #15

The overall brightness of the illuminated buttons is controlled by the LAMP BRIGHTNESS trim control. It simultaneously adjust both the "Dim" (OFF) and "Bright" (ON) intensity.

### 4.3.8 LISTEN LEVEL TRIMS -- Figure 4-1 item #13

The INTERCOM VOLUME control sets the overall Listen level of the 12 intercom channels. Each of the twelve intercom channels also have LISTEN TRIM controls located under each of the respective TALK buttons.

These LISTEN TRIM controls allow the individual level adjustment of each intercom channel. These controls only have a range of 20 dB. The fully clockwise position of the controls is the normal listen level.

## 4.4 HEADSET CONNECTOR

The HEADSET CONNECTOR allows the user to connect a mono headset directly in the front panel. The presence of a headset is sensed by the systems microprocessor. Connecting a headset will cause the station to automatically switch to the headset microphone and turn the speaker off. Disconnecting a headset will cause the station to switch to the Panel microphone and enable speaker operation.

While a headset is connected it is possible to select microphones and turn the speaker on and off with the PANEL MIC button and SPEAKER ON button.

If this connector is not used but the rear panel access of the headset circuit is used to bring the headset connector out to some other location other than the front panel, the presence of a headset will still be sensed and the station will operate as if the headset were plugged into the front panel connector.

## 4.5 STATION PROGRAMMING

A major feature of the MS-812 is that the function and attributes of front panel buttons can be defined by the user. Multiple versions (four) of these setups can be saved in Non-Volatile Memory that is secure during power down of the station.

The LCD display guides the user through multiple menus for programming. Two different levels of menus are available.

Once in the Programming Mode the NEXT (∇) and BACK (Δ) buttons are used for stepping from menu to menu. In a given menu function, buttons that are available to be programmed to the particular function are Flashing. Buttons whose lamps are on solid are programmed for that function. Buttons whose lamps are off are not available for the function. Some functions interact; example -- An intercom channel cannot be programmed for program interrupt unless its program feed is enabled -- A button that is LOCKED OFF cannot be LOCKED ON.

If a particular menu item is a Sub-Menu the SA button will flash. Pressing the SA button will open the availability of items inside the Sub-Menu. Going on to the next menu item without pressing SA will skip all of the Sub-Menu items.

**NORMAL MENU:** Once a station is setup, the day-to-day operation of the machine usually will not require all of the programming features available. A shortened version of the programming menu provides quick access to the menu items that are most used.

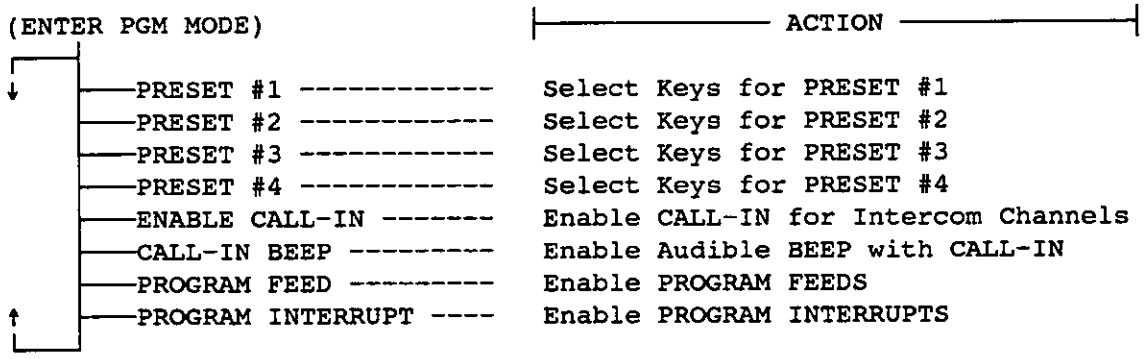



Figure 4-2 Normal Menu

**EXTENDED MENU:** To support very sophisticated use of the MS-812, an extended version of the programming menu is provided. In the extended menu some of the subjects have been grouped into sub-menus. Some of the menu items that support special features of the MS-812 can be turned off by internal DIP switches so that these menu items will not be displayed if the feature is not used.

The DIP switches only affect the availability of the menus but do not affect the operation of the station. The following is description of the DIP switches.

1. MULTIPLE SETUP MENU ENABLE This DIP switch only enables the access of the multiple SETUP menu.
2. EXTENDED MENU ENABLE
3. BUTTON LOCK ON/OFF MENU ENABLE
4. IFB BUTTON ASSIGNMENT MENU ENABLE
5. ISO BUTTON ASSIGNMENT MENU ENABLE

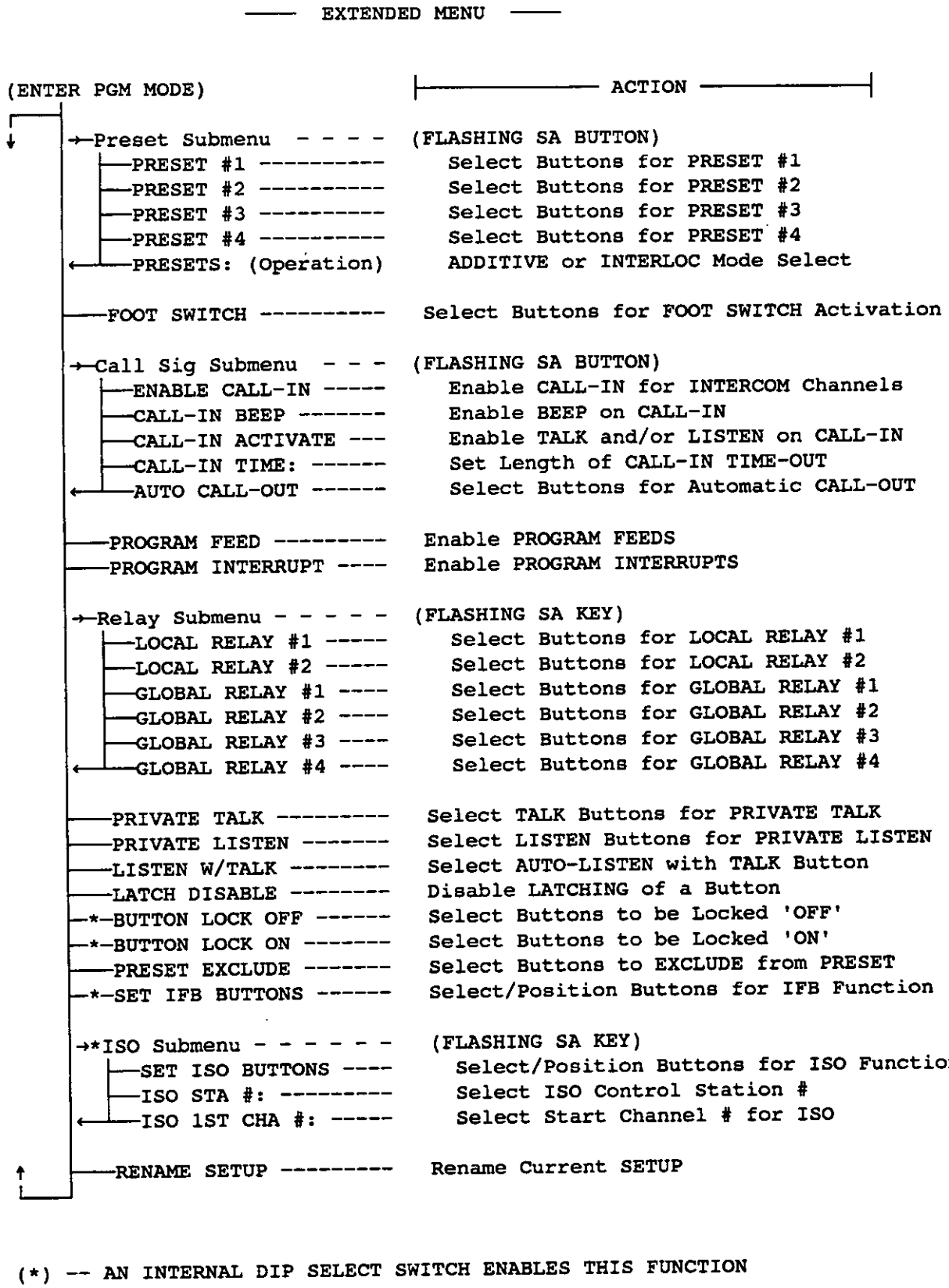

EXTENDED MENU
(ENTER PGM MODE)
ACTION
Preset Submenu - - - -
(FLASHING SA BUTTON)
PRESET #1 ----------
Select Buttons for PRESET #1
PRESET #2 ----------
Select Buttons for PRESET #2
PRESET #3 ----------
Select Buttons for PRESET #3
PRESET #4 ----------
Select Buttons for PRESET #4
PRESETS: (Operation)
ADDITIVE or INTERLOC Mode Select
FOOT SWITCH ----------
Select Buttons for FOOT SWITCH Activation
Call Sig Submenu - - -
(FLASHING SA BUTTON)
ENABLE CALL-IN -----
Enable CALL-IN for INTERCOM Channels
CALL-IN BEEP -------
Enable BEEP on CALL-IN
CALL-IN ACTIVATE ---
Enable TALK and/or LISTEN on CALL-IN
CALL-IN TIME: ------
Set Length of CALL-IN TIME-OUT
AUTO CALL-OUT ------
Select Buttons for Automatic CALL-OUT
PROGRAM FEED ---------
Enable PROGRAM FEEDS
PROGRAM INTERRUPT ----
Enable PROGRAM INTERRUPTS
Relay Submenu - - - - -
(FLASHING SA KEY)
LOCAL RELAY #1 -----
Select Buttons for LOCAL RELAY #1
LOCAL RELAY #2 -----
Select Buttons for LOCAL RELAY #2
GLOBAL RELAY #1 ----
Select Buttons for GLOBAL RELAY #1
GLOBAL RELAY #2 ----
Select Buttons for GLOBAL RELAY #2
GLOBAL RELAY #3 ----
Select Buttons for GLOBAL RELAY #3
GLOBAL RELAY #4 ----
Select Buttons for GLOBAL RELAY #4
PRIVATE TALK ---------
Select TALK Buttons for PRIVATE TALK
PRIVATE LISTEN -------
Select LISTEN Buttons for PRIVATE LISTEN
LISTEN W/TALK --------
Select AUTO-LISTEN with TALK Button
LATCH DISABLE --------
Disable LATCHING of a Button
*BUTTON LOCK OFF ------
Select Buttons to be Locked 'OFF'
*BUTTON LOCK ON -------
Select Buttons to be Locked 'ON'
PRESET EXCLUDE -------
Select Buttons to EXCLUDE from PRESET
*SET IFB BUTTONS ------
Select/Position Buttons for IFB Function
*ISO Submenu - - - - - -
(FLASHING SA KEY)
SET ISO BUTTONS ----
Select/Position Buttons for ISO Function
ISO STA #: ---------
Select ISO Control Station #
ISO 1ST CHA #: -----
Select Start Channel # for ISO
RENAME SETUP ---------
Rename Current SETUP
(*) -- AN INTERNAL DIP SELECT SWITCH ENABLES THIS FUNCTION

Figure 4-3 Extended Menu

### 4.5.1 ENTERING PROGRAMMING MODE

Pressing and holding NEXT (∇) and BACK (Δ) buttons together for one second will cause the LCD screen to display "MENU" and enter the programming mode. While the word "MENU" is displayed, quickly releasing and pressing both buttons again will cause the station to access the EXTENDED MENU, if it is enabled with a DIP switch. See section 4.5.

### 4.5.2 STEPPING THROUGH MENUS

When the system is in the programming mode the NEXT (∇) and BACK (Δ) buttons are used for stepping through the menus. Pressing and releasing NEXT (∇) steps forward in the menu while pressing and releasing BACK (Δ) steps backward.

### 4.5.3 SUB-MENU ACCESS

If a 'Sub-Menu' selection is displayed, pressing the flashing SA key at this time will open a series of related 'Sub-Menu' items. After pressing the SA button, the 'Sub-Menu' is available with the NEXT (∇) button.

A Sub-Menu that has been "opened" will remain "open" during the entire programming session, even if the particular Sub-Menu is left and then returned to.

### 4.5.4 EXITING PROGRAMMING MODE

Pressing both NEXT (∇) and BACK (Δ) buttons together while in any of the above menus will exit the programming mode, and return the MS-812 to normal operation.

## 4.6 DESCRIPTION OF PROGRAMMING MENUS

The following paragraphs describe each menu function in detail. All NORMAL MENU items are also in the EXTENDED MODE. In this discussion no distinction is made for those items found in sub-menus. For a better understanding of the menu organization refer to the menu trees in figure 4-2 and figure 4-3 on pages 4-10 and 4-11.

### 4.6.1 PRESET ASSIGNMENT

DEFAULT: No buttons programmed to PRESETs.
MENU TYPE: Normal or Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: None

Allows assignment of any combination of the 24 selector buttons and the SA button to be assigned to, and subsequently activated by, any of the four PRESET buttons. Use NEXT (∇) and BACK (Δ) to select the PRESET button to be programmed. Relays are assigned to PRESET buttons with their own menus; see section 4.6.11.

Other menus that affect the operation of PRESETs are as follows:

--PRESET OPERATION MODE see section 4.6.2
--PRESET EXCLUDE see section 4.6.18

### 4.6.2 PRESET OPERATION MODE

DEFAULT: INTERLOC
MENU TYPE: Extended Mode in a Sub-Menu.
DIP SWITCH ENABLING: None

This menu provides selection of PRESET operation modes. Pressing and releasing the flashing SA button will toggle from one mode to the other.

**INTERLOCK MODE:** This mode simulates a mechanically interlocking series of switches.

-- Pressing a PRESET removes all current button settings and replaces them with the PRESET's functions.
-- Pressing a second PRESET while another is active will remove the first PRESET and activate the second PRESET's functions. If the second preset is momentary in action, when it is released the station will return to the operation setup by the first latched PRESET.
-- When all PRESETS are removed the station will return to whatever setup was present before any PRESET was activated.

**ADDITIVE MODE:** In the additive mode multiple PRESETs simply add their respective functions and only remove their respective functions when turned off.

### 4.6.3 FOOTSWITCH ASSIGNMENT

| FOOT SWITCH |
|---|

DEFAULT: No buttons programmed to footswitch.
MENU TYPE: Extended Mode.
DIP SWITCH ENABLING: None

Allows an external switch (usually a foot switch) to activate any combination of front panel buttons.

### 4.6.4 ENABLE CALL-IN

| ENABLE CALL-IN |
|---|

DEFAULT: Enabled on all channels
MENU TYPE: Normal or Sub-Menu in Extended Mode
DIP SWITCH ENABLING: None

Allows selection of which channels respond (with a flashing button) to an incoming CALL signal from the intercom line.

### 4.6.5 CALL-IN BEEP

| CALL-IN BEEP |
|---|

DEFAULT: Disabled
MENU TYPE: Normal or Sub-Menu in Extended Mode
DIP SWITCH ENABLING: None

Allows selection of which channels respond with an audible BEEP tone to an incoming CALL signal from the intercom line.

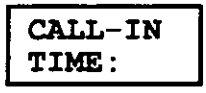
For a channel to be ENABLED for BEEP it must have been enabled in the previous CALL-IN ENABLE menu. If a channel is re-enabled in the CALL-IN ENABLE menu the BEEP on that channel will default to being off.

### 4.6.6 CALL-IN ACTIVATE

DEFAULT: Disabled on all channels.
MENU TYPE: Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: None

Causes an incoming CALL signal on an intercom line to automatically turn ON the associated channel's TALK and/or LISTEN circuit, allowing the caller to control that channel of the 812.

### 4.6.7 CALL-IN TIME OUT




DEFAULT: 20 Seconds.
MENU TYPE: Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: None

Sets the time that a CALL light continues to flash after the CALL signal is no longer present on the intercom channel. Pressing the flashing SA button will "step" through the different possible time-out durations.

### 4.6.8 AUTO CALL-OUT

DEFAULT: Disabled on all channels.
MENU TYPE: Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: None

The "AUTO CALL-OUT" function allows sending a CALL signal with either a TALK or LISTEN button activation. The signal will be continuously sent on the intercom line as long as the TALK or LISTEN circuit to the channel is ON.

### 4.6.9 PROGRAM FEED

| PROGRAM FEED |
|---|

DEFAULT: Disabled on all channels
MENU TYPE: Normal
DIP SWITCH ENABLING: None

Sends a program signal to any combination of intercom channels. Can be programed to provide internal PROGRAM INTERRUPT function (refer to 4.6.10).

### 4.6.10 PROGRAM INTERRUPT

DEFAULT: Disabled on all channels
MENU TYPE: Normal
DIP SWITCH ENABLING: None

Causes a PROGRAM INTERRUPT function to take place when a channel TALK button is activated.

NOTE: For a channel to be ENABLED for PROGRAM INTERRUPT the PROGRAM FEED must have been ENABLED in the previous menu.

### 4.6.11 RELAY ASSIGNMENTS

DEFAULT: None programmed
MENU TYPE: Sub-Menu in Extended Mode
DIP SWITCH ENABLING: None

This allows the relays, both LOCAL and GLOBAL to be activated by any combination of the front panel buttons. There is a separate menu item for each of the six relays (2 local, 4 global).

### 4.6.12 PRIVATE TALK

DEFAULT: Enabled for ISO and SA
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: None

When a button is programmed for PRIVATE TALK, activation of that button will momentarily disable other TALK paths while the button is active. With the Private Talk disabled, ISO, and SA will not disable other talk paths when activated.

### 4.6.13 PRIVATE LISTEN

DEFAULT: Disabled on all channels
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: None

When an Intercom, ISO, or SA button is programmed for PRIVATE LISTEN, activation of that button will momentarily disable other LISTEN paths while the button is active.

### 4.6.14 LISTEN WITH TALK

DEFAULT: Disabled on all channels
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: None

Causes the intercom channel LISTEN circuit to be turned ON whenever the associated TALK button is ON. This function provides Single button activation of an intercom channel.

### 4.6.15 LATCH DISABLE

DEFAULT: IFB and SA functions
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: None

This allows the "LATCH" function to be disabled, so the button will only work "momentarily" (only as long as the button is held).

### 4.6.16 BUTTON LOCK OFF

| BUTTON<br>LOCK OFF |
|---|

DEFAULT: None locked OFF
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: DIP SW# 3 (ON = Enabled)

This allows a button to be locked "OFF". This function only disables the physical action of the particular button. The particular function that the button is related to is still operational. The function normally controlled by the LOCKED OFF button could be activated by a PRESET button.

Buttons LOCKED ON cannot be LOCKED OFF and conversely buttons LOCKED OFF cannot be LOCKED ON. Refer to the next paragraph (4.6.17) for information on BUTTON LOCK ON menu.

### 4.6.17 BUTTON LOCK ON

| BUTTON<br>LOCK ON |
|---|

DEFAULT: None locked ON
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: DIP SW#3 (ON = Enabled)

This allows a button to be locked "ON". When locked ON, the circuit remains activated at all times.

Buttons LOCKED ON cannot be LOCKED OFF and conversely buttons LOCKED OFF cannot be LOCKED ON. Refer to the last paragraph (4.6.16) for information on BUTTON LOCK OFF menu.

### 4.6.18 PRESET EXCLUDE

| PRESET<br>EXCLUDE |
|---|

DEFAULT: None programmed
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: None

This function excludes a button from being affected by a preset. Some applications require that a communication channel be considered to be a "priority" channel. (i.e. a telephone line circuit).

### 4.6.19 SET IFB BUTTONS

| SET IFB BUTTONS |
|---|

DEFAULT: None programmed
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: DIP SW #4 (ON = Enabled)

Allows the 812 to control one or two external PIC-4000B IFB Electronics. This mode allows the selection of "where" on the panel the IFB buttons appear, and "how many" IFB channels are accessed (2,4,6, or 8). NOTE: IFB buttons are always assigned in pairs, replacing one INTERCOM LISTEN/TALK pair.

First choose the "starting" position of the first two channels by pressing the desired talk button. The button lamps will respond by reflecting your choice. Then position the remaining desired channels by pressing the TALK buttons on either side of the first two. Buttons previously programmed for ISO (see section 4.6.20 below) will not be available for IFB.

The microprocessor will automatically number and activate the proper IFB line drivers and buttons. The channel number assignment to the buttons will be as follows:

| | | | |
|---|---|---|---|
| 1 | 1 2 | 1 2 3 | 1 2 3 4 |
| 2 | 3 4 | 4 5 6 | 5 6 7 8 |

### 4.6.20 SET ISO BUTTONS

| SET ISO BUTTONS |
|---|

DEFAULT: None Programmed
MENU TYPE: Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: DIP SW #5 (ON = Enabled)

The 812 can control an external ISO-4000 Station ISO Electronics. This menu item allows the selection of "where" on the panel the ISO buttons appear, and "how many" ISO channels are accessed (2, 4, 6, 8, 10, 12, 14, or 16). NOTE: ISO buttons are numbered like IFB buttons.

All of the available button positions will flash. The chosen positions will be on solid. Buttons previously programmed for IFB will not be available for ISO.

First choose the "starting" position of the first two channels by pressing the desired talk button. The button lamps will respond by reflecting your choice. Then position the remaining desired channels by pressing the TALK buttons on either side of the first two.

(SET ISO BUTTONS continued)

The microprocessor will automatically number and activate the proper buttons. The channel number assignment of the buttons is similar to the scheme used for IFB buttons (refer to section 4.6.19) except that the starting number in the top left corner of the button pattern may not be 1.

The first channel number may be set to some number other than 1 with the SET ISO FIRST CHANNEL NUMBER menu (refer to section 4.6.22). An example of eight ISO channels starting with channel number 5 is as follows:

```
5  6  7  8
9 10 11 12
```

### 4.6.21 SET ISO STATION NUMBER

```
ISO
STA #:
```

DEFAULT: STATION # 1
MENU TYPE: Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: DIP SW #5 (ON = Enabled)

You must identify the number (1-6) of the ISO "Control Location". Refer to the ISO-4000 manual for more information. Pressing the flashing SA button will step through the station numbers and display them on the LCD display. The ISO station number is common to all four SETUPs and is not affected by SETUP RESET.

To allow for connecting an External ISO system without ISO control signals, **the ISO Station Number can be set to '0'** to indicate that the ISO sense is valid regardless of the presence of ISO control signals on the 6-Pin data bus from the ISO-4000 system. The ISO transfer function will operate without an ISO system connected. If buttons are programmed to ISO function when the Control Station Number is set to '0', an error message will be issued and Button check will indicate the problem.

### 4.6.22 SET ISO FIRST CHANNEL NUMBER

```
ISO 1ST
CH #:
```

DEFAULT: CHANNEL #1
MENU TYPE: Sub-Menu in Extended Mode.
DIP SWITCH ENABLING: DIP SW #5 (ON = Enabled)

The user must identify first channel number that the buttons relate to for the given ISO "Control Location". Pressing the flashing SA button will step through the "ISO 1ST CH #: " screen. The available starting channel numbers are 1-15. The last available channel number will vary according to the number of programmed ISO channels.

### 4.6.23 RENAME SETUP

| RENAME SETUP |
|---|

DEFAULT: "SETUP # (1-4)"
MENU TYPE: Extended Mode
DIP SWITCH ENABLING: None

The name of the currently selected SETUP (what is displayed during normal operation) can be assigned by the user.

Pressing the flashing SA button will present a screen of the current SETUP name for modification. A cursor will appear under the first character indicating that it is available for modification. Pressing the NEXT (∇) button will step the characters forward through the alphabet and numbers. The BACK (Δ) button will step backwards. When the desired character is displayed in the current character position, press the SA button to move the cursor to the next position.

Set all character positions that need to be changed including those that are to be spaces. Passing through the sixteenth character will cause the program to exit the REMANE SETUP menu. The edit menu can also be exited any time by pressing both the NEXT (∇) and BACK (Δ) buttons.

Pressing the RESET button while in this menu will clear the screen and will result in default name assignment upon exit if no other is assigned.

# SECTION 5 / MAINTENANCE OF THE MS-812 PROGRAMMABLE MASTER INTERCOM STATION

## 5.1 POWER SUPPLY DESCRIPTIONS

The power supplies in the MS-812 are intended to only power the internal circuitry of the unit. An AC line voltage switch, located inside the unit, allows the 812 to operate on 115 or 230 VAC. All internal power is regulated.

### 5.1.1 GROUND ISOLATION:

Care was taken in the ground trace design to isolate the +5 DC logic return ground from the analog ground. These two ground systems are only connected at a common point physically located at the power supplies.

The internal Ground is not directly connected to chassis in Clear-Com systems. A 10 Ohm resistor with several bypass capacitors are connected between audio ground and chassis. Clear-Com intercom is based on an unbalanced audio line. In large systems, the AC ground for AC power sometimes has a potential difference at different locations in an installation. If each Main or Master station in the system has a ground reference through their 10 Ohm resistors, hum can be induced in the audio ground returns of the intercom lines.

If connecting several stations together produces a HUM remove all of the 10 Ohm resistors in each unit except for one. It is mandatory that at least one have the resistor.

### 5.1.2 DIGITAL +5 VOLTS:

The +5 volt regulator supplies DC power for the Microprocessor and related components. All logic components except for the shift registers that interface to the CMOS switches in the audio circuitry are powered from this supply.

### 5.1.3 DIGITAL +15 VOLTS

The CMOS analog switches need to see a control voltage that swings from 1 volt to +14 volts. The logic devices are operated from 15 volts to provide this logic swing.

### 5.1.4 LAMP REGULATED SUPPLY

The lamps on the front panel are supplied power from a regulator whose reference is set by a front panel trim control. The front panel trim control allows the user to the set the lamp brightness depending on ambient lighting conditions. The range of this regulated supply is 2 to 5 volts.

### 5.1.5 +30 VOLT AUDIO POWER SUPPLY

All of the audio circuitry in the MS-812 is powered from a single +30 volt regulated supply. This power supply has a variable reference circuit that will reduce the output voltage if the transformer secondary voltage falls. This variable reference feature allows the supply to still regulate and produce low noise figures even if the AC line voltage falls. Power supply output of 22 to 30 volts are acceptable for the audio circuitry and produce no ill side effects except for a reduction in headroom in the speaker amplifier.

### 5.1.6 AUDIO BIAS AND VCA REFERENCE SUPPLIES

The audio circuitry is powered from a single +30 volt supply. When operating OP-amps in an unbalanced mode they need a bias reference voltage that should be 1/2 the supply. The two sections of IC10 are buffers providing a low impedance bias voltage for this purpose.

B1 is a general bias source for most of the audio circuitry.

B2 is reserved for use with the VCAs and their OP-amps. The control voltage for the VCAs must swing between 5 volts above bias and bias. For this reason VR5 is referenced to B2 providing a supply voltage that is stable 5 volts above B2 (bias for the VCAs).

## 5.2 MICROPROCESSOR AND LOGIC DESCRIPTION

### 5.2.1 MICROPROCESSOR DESCRIPTION

The control system of the MS-812 is based on a central bus-oriented microprocessor. The first 8 bits of data and address are multiplexed together and are separated by IC4 providing A0-A7 as a separate bus. IC5 is a EPROM that provides program memory for the processor. IC6 provides 4K bytes of static operation RAM for the processor. IC8 is an address decoder for the various memory mapped devices. IC9 is a RESET control device monitoring the +5 volt supply in case it is out of range. IC2 is a serial access 512 byte EEPROM device that stores the SETUP memory for the system.

#### GUIDELINES FOR TROUBLESHOOTING MICROPROCESSORS

1. Catastrophic failures of a firm-ware controlled microprocessor are rarely caused by program faults. If programs work at all they generally completely work. Program faults show up as functions that do not work as intended.

2. Check the +5 volt supply for voltage (4.75 to 5.25 volts) and noise. Power supply noise must be less than 50 mV.

3. Check for the presence of a system clock signal (aprox. 1.8 MHz square wave) on Pin-6 of IC8.

### 5.2.2 FRONT PANEL LOGIC FLOW

**LCD DISPLAY** The LCD Display contains its own drive and scan circuitry. To the microprocessor it is a memory mapped device on the data bus.

**FRONT PANEL BUTTONS** All front panel buttons are read indirectly by IC3 pulling one of its output pin down thereby placing any closed switches on the inputs of IC2. To the microprocessor IC2 and IC3 are memory mapped devices. Typical problems in this area are shorted buses or shorted blocking diodes.

**FRONT PANEL LAMPS** All but one of the front panel lamps are controlled by a 32 bit shift register (IC1) with output drive capability. The SA lamp is driven from a shift register located on the main board. The serial inputs of IC1 are generated by the microprocessor program using IC3 as an output to IC1. It will be noted that each driver output has a resistor across it providing some current to the lamps, this 'off' current is the dim level of the lamps.

### 5.2.3 LINE DRIVE MODULE CONTROL

The Four Channel Line Drive Module has 12 CMOS switches for controlling audio to and from the four line drivers. The 12 CMOS switches and 4 CALL signal drivers are controlled by two 8 bit shift registers. The DATA and CLOCK lines of all five modules are common. Only the STROBE lines are unique to each module. All five modules shift in all of the data but only the targeted module latches it.

The CALL signal sense circuits are constructed using a comparator with an open-collector output. The open-collector outputs of each module are bussed together for input to the processor. The sense circuits (comparators) are enabled by lowering their reference input to the desired threshold for CALL sensing. The CALL strobes are unique for each module.

### 5.2.4 MAIN BOARD AUDIO CONTROL

The control of the audio circuits on the main PCB is accomplished through two serial shift register ICs (IC26 and IC27). IC27 has open collector type outputs and is capable of sinking enough current to directly drive relays RLY1 and RLY2.

IC24 and 1/2 of IC25 is used to shift the 5 volt logic of the microprocessor output to a 15 volt logic level that can be directly connected to CMOS switches.

IC23 is used to decode 4 outputs from the microprocessor into 16 strobe lines used for latching the various shift registers in the system and enabling logic input to port E of the microprocessor.

### 5.2.5 EXTERNAL ISO SYSTEM INTERFACE

IC3 and Q3 provide buffering of the ISO-4000 data bus for the MS-812s microprocessor. The MS-812s software simulates the activity of ICP-4 modules that are usually used to control the ISO system.

The inputs from the ISO system are AC coupled to the inputs of IC3. IC3 is a Schmidtt trigger type device thereby cleaning up the ISO bus signals.

## 5.3 ANALOG DESCRIPTION

### 5.3.1 CLEAR-COM LINE DRIVERS

Clear-Com intercom systems are designed around the concept of high impedance current sources driving a common low impedance load. The line drivers provide a current signal that develops a voltage across the termination.

If a Clear-Com line is not terminated properly, signal levels will be non-standard. Mutiple termination will produce low levels. No termination will produce excessive levels and high distortion.

The standard Clear-Com termination is 220 Ohms in series with 4.7 K Ohms with a 10 uF electrolytic capacitor across the 4.7 K resistor. This network exhibits an impedance of 220 Ohms at audio frequencies with its impedance increasing to 5 K Ohms at DC. The higher DC impedance is necessary to allow the Clear-Com CALL signal to have a higher voltage level.

> **NOTE: Unused intercom lines should be terminated. Unterminated line drivers may oscillate and cause general noise in the system. It is permissible to short unused line drivers to ground. The SA output to the ELCO cable and ISO Audio is the same type of driver and must have termination.**

Clear-Com CALL sense circuits will trigger on a DC voltage greater than 3 volts. CALL send circuits will produce at least 10 volts DC. CALL send circuits are current sources also allowing them to have a high audio impedance.

The Clear-Com line receive circuit forms a hybrid circuit attempting to null the TALK signal out of the LISTEN signal. The hybrid is a bridge circuit that depends on a known impedance of the intercom line. The side-tone null adjustment adjust this bridge within a range. Multiple terminations and no termination are out of range of this circuit.

### 5.3.2 USE OF VCAs

The MS-812 utilizes VCA (Voltage Controlled Amplifier) circuits for gain control of most of the audio signals that are controlled from front panel controls. The use of VCAs allows the control element to be located in an electrically noisy environment.

The devices used in the MS-812 are voltage controlled current multipliers. Being that their output is current, all of these devices need a current-to-voltage conversion which is accomplished with the OP-amp that follows them.

Because their outputs are current, several of these devices can sum into the same input node of an OP-amp. These devices may also be placed in series acting like two pots in series. The control voltages of two sections can be supplied from a common source producing a tracking control of two separate audio channels. There are examples of all of these modes in the MS-812.

(USE OF VCAs continued)

(USE OF VCAs continued)

It will be noted that because the signals in the VCA are in current mode, very little signal voltage can be measured either at their inputs or outputs.

The SPEAKER MUTE trim control is normally disabled by a CMOS switch (IC29 section D) shorting out the control. When the microprocessor turns the switch off the control is active.

### 5.3.3 GAIN STRUCTURE

0.0 dBv = 0.774 AC Volts RMS

All readings: +/- 2 dB at 1 KHz

#### 5.3.3.1 DYNAMIC MIC to INTERNAL TALK BUS GAIN

WITHOUT LIMITER ACTION:

INPUT -- Pin-2 of headset connector = -55 dBv
OUTPUT - Pin-1 of IC11 = 0.0 dBv

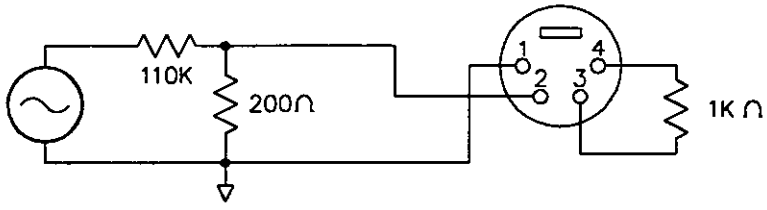



Figure 5-1 Input Pad for Mic Gain Measurement

WITH LIMITER ACTION:

INPUT -- Pin-2 of headset connector = -40 dBv
OUTPUT - Pin-1 of IC11 = +10 dBv

#### 5.3.3.2 INTERNAL TALK BUS to INTERCOM LINE GAIN

TALK BUS (Pin-1 of IC11) = 0.0 dBv
Terminated Intercom, IFB, and ISO Lines = -15 dBv

#### 5.3.3.3 INTERNAL TALK BUS to HOT MIC and LOCAL SA GAIN

TALK BUS (Pin-1 of IC11) = 0.0 dBv
600 Ohm Terminated Hot Mic or SA OUT = -8 dBv

### 5.3.3.4 INTERNAL TALK BUS to GLOBAL SA GAIN

| | |
|---|---|
| TALK BUS (Pin-1 of IC11) | = 0.0 dBv |
| 600 Ohm Terminated Global SA Output | = -8 dBv |

### 5.3.3.5 BALLANCED PROGRAM INPUTs to INTERNAL PRG BUS GAIN

Both program inputs are inentical in gain structure. Measurements are with front panel PROGRAM volume and PRG FEED TRIM fully clockwise. If J32 is installed Program #1 should show at Program #2's output also at the same gain.

| | |
|---|---|
| PROGRAM INPUT #1 (Pins 2 & 3 of XLR) | = -10 dBv (ballanced) |
| Internal Program Bus #1 (IC14 - PIN-7) | = 0.0 dBv |
| | |
| PROGRAM INPUT #2 (Pins 6 & 13 of DB15) | = -10 dBv (ballanced) |
| Internal Program Bus #1 (IC14 - PIN-1) | = 0.0 dBv |

### 5.3.3.6 INTERNAL PRG BUS to INTERCOM LINE GAIN

| | |
|---|---|
| PRG BUS (IC14 Pin-7) | = 0.0 dBv |
| Terminated Intercom Lines | = -15 dBv |

### 5.3.3.7 INTERCOM LINES to LISTEN BUS LINE GAIN

All Listen TRIM controls on the front panel set fully clockwise. The NULL control for the channel under test should be set fully clockwise.

| | |
|---|---|
| Terminated Intercom and ISO Lines | = -10 dBv |
| Internal LISTEN BUS (IC17 Pin-7) | = 0.0 dBv |

### 5.3.3.8 INTERNAL LISTEN BUS to SPEAKER GAIN

Front Panel INTERCOM Volume control and MUTE LEVEL Trim conrols set to fully clockwise. The NULL control for the channel under test should be set fully clockwise.

| | |
|---|---|
| Internal LISTEN BUS (IC17 Pin-7) | = -10.0 dBv |
| Speaker Terminals | = +20 dBv |

### 5.3.3.9 INTERNAL LISTEN BUS to HEADSET GAIN

Front Panel INTERCOM Volume control set to fully clockwise. The NULL control for the channel under test should be set fully clockwise.

| | |
|---|---|
| Internal LISTEN BUS (IC17 Pin-7) | = -10.0 dBv |
| Headset Output | = +18 dBv |

## 5.4 TROUBLE SYMPTOMS, POSSIBLE CAUSES & SOLUTIONS

The following section gives some of the possible problems that may occur in operation of the MS-812.

No or dim push button **LIGHTS**
-- Check the setting of the LAMP BRIGHTNESS trim control.

One particular **LIGHT** does come on bright or dim.
-- Replace lamp.

No or low **BEEP** tone in SPEAKER
-- Check setting of BEEP TONE trim level.

No **BEEP** tones in HEADPHONES
-- Normal condition.

**BEEP** TONE when a selector button is pressed.
-- The button has not been programmed to any function.
-- The LINE DRIVER MODULE that supports the button is not present.

No or low **SPEAKER** volume
-- Check setting of MUTE LEVEL trim control.
-- Check setting of INTERCOM volume control.
-- Check SPEAKER ON button.

Low **SIDETONE** volume in HEADPHONES
-- Check setting of SIDETONE LEVEL control.

Excessive **SIDETONE** or feedback when in TALK mode.
-- Improper termination on intercom line.
-- Adjust NULL control on LINE DRIVER MODULE.
If the NULL control of an intercom line driver was adjusted when some local SIDETONE was present. Adjustment of the NULL controls on all line drivers must be done with no LOCAL sidetone present. The LOCAL sidetone generated internally will be out of phase with the sidetone generated by a poor NULL. The mixing of the two will produce a faulse null point.

Low or dissimilar **VOLUME** on INTERCOM channels.
-- Improper termination.

Excessive interchannel **CROSSTALK**.
-- Improper system wiring.

Excessive background **NOISE**.
- -- A microphone latched on somewhere in the system.
- -- An unterminated line is very noisy. An unterminated line other than the one being listened to may oscillate and cause general system noise.

**HUM** in SPEAKER or HEADPHONES.
- -- Improper system grounding. Chassis ground cannot be connected to intercom common ground. See section 5.1.1.
- -- The 10 Ohm resistor (R190) between intercom ground and chassis ground is open. See section 5.1.1.

No **PROGRAM** volume in HEADPHONES.
- -- Install J32 and/or J34.

**LOSS of PROGRAMMED FUNCTIONS and SETUPs**
- -- Station has been RESET either in the particular SETUP or globally. Reprogram the station.

Cannot Send **CALL**.
- -- Make sure that the TALK selector button is not programmed for IFB or ISO.
- -- Swap or replace the LINE DRIVER MODULE.

Cannot Receive **CALL**.
- -- Make sure that CALL Receive is enabled for the channel.
- -- Make sure that the patricular LISTEN button is not programmed for IFB or ISO.
- -- Swap or replace the LINE DRIVER MODULE.

No **TALK** Audio on intercom line.
- -- Make sure that the TALK selector button is not programmed for IFB or ISO.
- -- Swap or replace the LINE DRIVER MODULE.

Low or uneven **LISTEN** volume on INTERCOM channels.
- -- Check LISTEN LEVEL trim controls.

No **LISTEN** Audio on intercom line.
- -- Make sure that the LISTEN selector button is not programmed for IFB or ISO.
- -- Swap or replace the LINE DRIVER MODULE.

## SECTION 6 -- BLOCK DIAGRAMS AND ASSEMBLY DRAWINGS

### 6.1 ASSEMBLY 720095 MS-812 CHASSIS PARTS

**MISCELLANY**

| | |
|---|---|
| 500089 | 3 INCH ROUND SPEAKER CTS#3A2479 |
| 500090 | PRIMO GOOSENECK MICROPHONE #EM4544 |
| 500096 | FOAM WINDSCREEN FOR PRIMO MIC #WS-31 |
| 730100 | 34 POSITION RIBBON CABLE W/DUAL ROW IDC |
| 730101 | 16 POSITION RIBBON CABLE WITH DUAL ROW IDC |
| 730074 | DB-15 TO HEADER RIBBON CABLE ASSEMBLY |
| 210232 | POWER ENTRY MODULE WITH SWITCH AND FILTER |
| 560030 | POWER TRANSFORMER +/12VDC @.6A 5VDC @4A #DMT812AO5 |
| 250477 | LEGEND TRANSPARENCY FOR .720 KEY MS-812 |

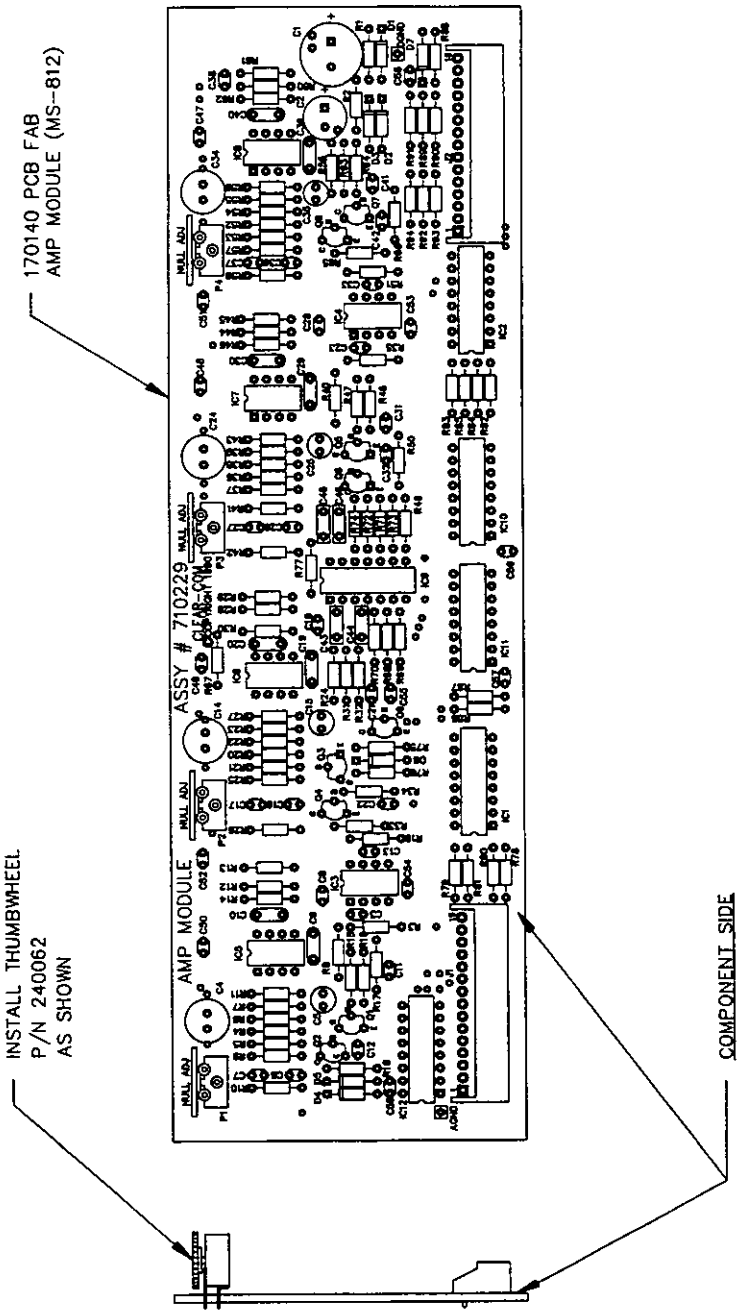



Figure 6-1 Amplifier Module PCB Assembly Drawing

## 6.2 ASSEMBLY 710229 MS-812 AMP MODULE BOM

### 1/4 W 5% RESISTORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 410004 | 22 OHMS | R1 |
| 410071 | 100 OHMS | R2 R92 R93 R94 |
| 410106 | 430 OHMS | R8 R24 R40 R56 |
| 410010 | 1K OHMS | R16 R32 R48 R64 |
| 410014 | 2K OHMS | R9 R25 R41 R57 |
| 410011 | 2.2K OHMS | R75 |
| 410137 | 6.2K OHMS | R28 R12 R44 R60 |
| 410016 | 10K OHMS | R86 R88 |
| 410079 | 120K OHMS | R13 R29 R45 R61 |
| 410018 | 22K OHMS | R77 R87 |
| 410020 | 33K OHMS | R76 |
| 410084 | 43K OHMS | R15 R31 R47 R63 |
| 410024 | 100K OHMS | R89 R90 R91 |
| 410148 | 100K OHMS | R14 R30 R46 R62 |
| 410026 | 150K OHMS | R18 R34 R50 R66 |
| 410028 | 220K OHMS | R17 R33 R49 R65 R67 R69 R71 R73 |
| 410030 | 470K OHMS | R68 R70 R72 R74 |
| 410045 | 680K OHMS | R10 R26 R42 R58 |

### 1/4 W 1% RESISTORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 410144 | 8.25K OHMS | R3 R19 R35 R51 |
| 410086 | 20.0K OHMS | R4 R5 R11 R20 R21 R27 R36 R37 R43 R52 R53 R59 R78 R79 R80 R81 R82 R83 R84 R85 |
| 410105 | 47.5K OHMS | R6 R7 R22 R23 R38 R39 R54 R55 |

### POTENTIOMETERS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 470053 | 5K TRIMPOT | P1 P2 P3 P4 |

## CAPACITORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 150026 | 39PF DISC 5% | C10 C20 C30 C40 |
| 150007 | 200PF DISC 10% | C9 C19 C29 C39 |
| 150101 | 820PF 50V 5% | C3 C13 C23 C33 |
| 150108 | .0022UF 50V MONO 10% | C6 C16 C26 C36 |
| 150008 | .022UF POLY 10% | C43 C44 C45 C46 |
| 150111 | .047UF 50V 10% | C7 C8 C17 C18 C27 C28 C37 C38 |
| 150112 | .1UF 100V MONO 20% | C12 C22 C32 C42 C47 C48 C49 C50 C51 C52 C53 C54 C55 C56 C57 C58 C59 |
| 150133 | .22UF 50V MONO | C11 C21 C31 C41 |
| 150002 | 1UF NP 50V ELECT. | C5 C15 C25 C35 |
| 150087 | 4.7UF NP 50V ELECT. | C4 C14 C24 C34 |
| 150011 | 100UF 35V ELECTR. | C1 |
| 150020 | 220UF 25V ELECTR. | C2 C60 |

## DIODES

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480001 | 1N4001 RECTIFIER DIODE | D1 D2 D3 D4 D5 D7 |
| 480000 | 1N4148 SIGNAL DIODE | D6 |

## TRANSISTORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480006 | 2N2222 TRANSISTOR | Q2 Q4 Q6 Q8 Q9 |
| 480008 | MPS-A63 TRANSISTOR | Q1 Q3 Q5 Q7 |

## INTEGRATED CIRCUITS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480107 | 4094B 8 BIT CMOS SHIFT REGISTER | IC10 IC11 |
| 480092 | DG11CJ QUAD CMOS ANALOG SWITCH | IC1 IC2 IC12 |
| 480166 | LM339N QUAD COMPARATOR | IC9 |
| 480070 | NE5532 DUAL LO NOISE OP AMP | IC5 IC6 IC7 IC8 |
| 480056 | RC4559NB OP AMP | IC3 IC4 |

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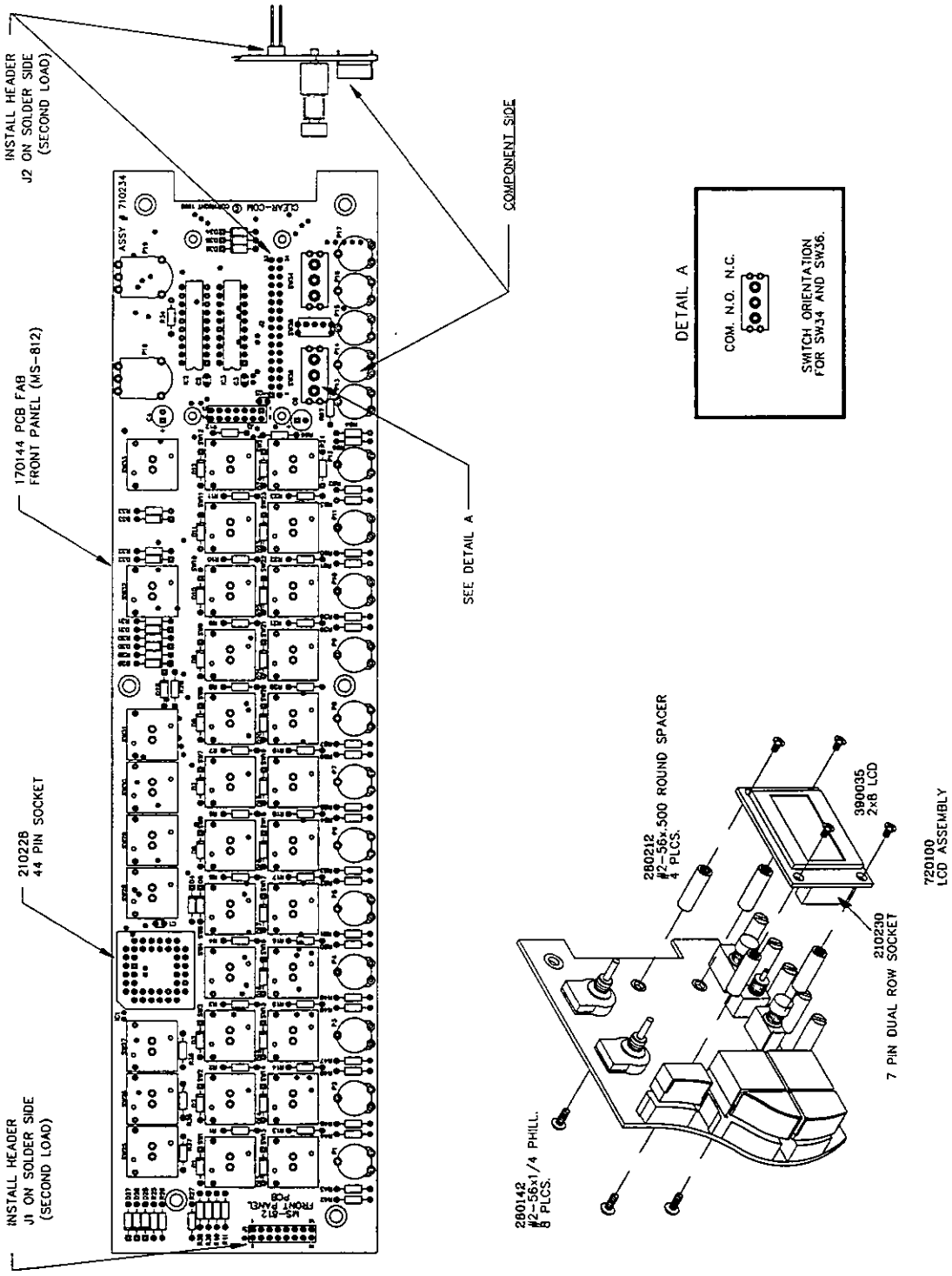



Figure 6-2 Front Panel PCB Assembly Drawing

## 6.3 ASSEMBLY 710234 MS-812 FRONT PANEL PCB BOM

### 1/4 W 5% RESISTORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 410071 | 100 OHMS | R1-R33 |
| 410044 | 680 OHMS | R67 |
| 410012 | 3.9 K OHMS | R66 |
| 410013 | 4.7 K OHMS | R68 R69 |
| 410016 | 10K OHMS | R34 R35 R36 R37 R38 R39 R40 R41 R42 R44 R46 R48 R50 R52 R54 R56 R58 R60 R62 R64 |

### POTENTIOMETERS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 470038 | 50K TRIMPOT | P1 - P16 P18 |
| 470060 | 500 OHM TRIMPOT | P17 |
| 470061 | 50K P.C. MOUNT POT | P19 P15 |

### CAPACITORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 150035 | .1UF 50 V MONO | C3 C2 C1 C5 → 47m 16V 150143 |
| 150010 112 | 22UF 25V ELECT Mon | C4 |
| 150099 | 100UF 25V ELECT. | C6 |

### DIODES

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480000 | 1N4148 SIGNAL DIODE | D1-D36 |

### INTEGRATED CIRCUITS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480121 | 74HC240 CMOS TRI-STATE INV BUFFER | IC2 |
| 480143 | 74HC374 CMOS TRISTATE OCTAL D FL/FLOP | IC3 |
| 480169 | UCN 5833 32 BIT POWER SHIFT REG W/LATCH | IC1 |

### SWITCHES

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 240064 | SMALL KEYCAP | SW25 - SW33 |
| 240065 | LARGE KEYCAP | SW1 - SW24 |
| 510086 | PUSHBUTTON SW, VEETRONIX | SW1-SW33 |
| 510088 | PUSHBUTTON SW, SPDT | SW34 SW36 |
| 510089 | PUSHBUTTON SW, SPDT | SW35 |

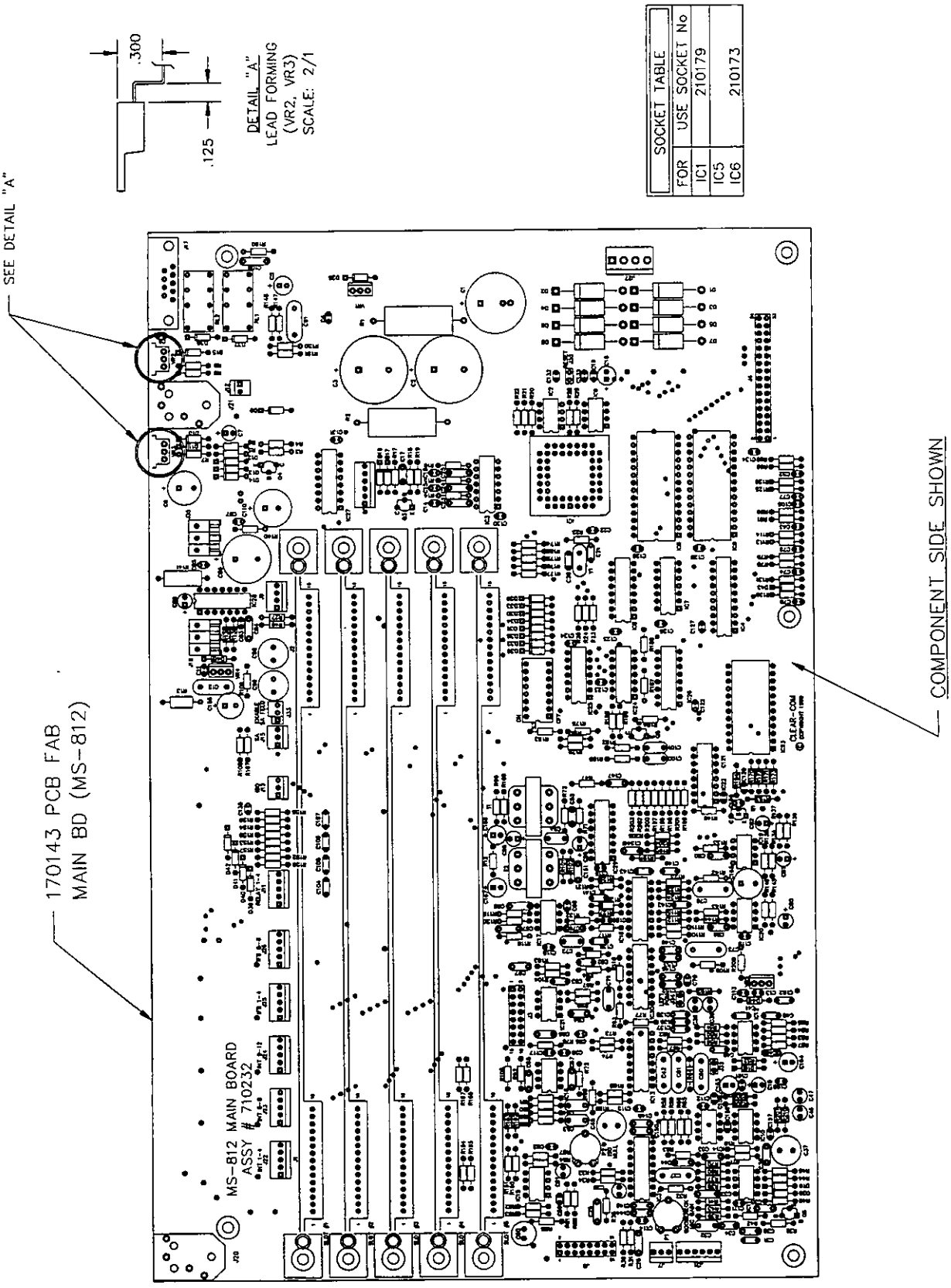



Figure 6-3 Main PCB Assembly Drawing

## 6.4 ASSEMBLY 710232 MS-812 MAIN PCB ASSEMBLY BOM

### 1/4 W 5% RESISTORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 410113 | 2.2 OHMS | R140 |
| 410002 | 10 OHMS | R190 R208 |
| 410004 | 22 OHMS | R134 R135 R145 R146 |
| 410112 | 27 OHMS | R19 |
| 410008 | 39 OHMS | R209 R210 |
| 410038 | 82 OHMS | R36 |
| 410071 | 100 OHMS | R5 R12 R118 R120 |
| 410072 | 200 OHMS | R59 R66 R74 R111 R115 R123 R128 |
| 410060 | 240 OHMS | R7 R8 R9 |
| 410005 | 390 OHMS | R150 R151 |
| 410106 | 430 OHMS | R86 |
| 410054 | 620 OHMS | R108 |
| 410010 | 1K OHMS | R17 R22 R32 R35 R94 R99 R100 R101 R102 R195-R207 |
| 410041 | 1.2K OHMS | R106 |
| 410014 | 2K OHMS | R87 |
| 410011 | 2.2K OHMS | R3 R147 R183 R188 |
| 410040 | 2.7K OHMS | R26 R37 |
| 410015 | 3.3K OHMS | R23 R24 R29 |
| 410170 | 3.6K OHMS | R61 R62 R67 R68 R77 R78 R113 R124 R125 R126 R127 R129 R130 R139 |
| 410013 | 4.7K OHMS | R18 R71 |
| 410056 | 5.6K OHMS | R6 |
| 410137 | 6.2K OHMS | R91 |
| 410036 | 6.8K OHMS | R41 |
| 410171 | 7.5K OHMS | R60 R69 R79 R114 R131 |
| 410100 | 9.1K OHMS | R44 |
| 410016 | 10K OHMS | R4 R14 R15 R16 R20 R21 R28 R31 R33 R34 R43 R96 R97 R98 R93 R109 R47 R63 R70 R116 R117 R119 R138 R142 R143 R148 R160-R177 R185 R187 R189 R191 R192 R193 R194 R110 R121 R122 |
| 410031 | 12K OHMS | R27 R38 R45 R46 |
| 410017 | 15K OHMS | R30 R136 |
| 410032 | 18K OHMS | R112 |
| 410151 | 20K OHMS | R132 R58 R64 R65 |
| 410018 | 22K OHMS | R95 R75 R73 R72 R76 R137 R149 R178 R186 |
| 410020 | 33K OHMS | R156 R157 R158 R159 R184 |
| 410024 | 100K OHMS | R92 |
| 410079 | 120K OHMS | R89 |
| 410109 | 200K OHMS | R133 R144 |
| 410028 | 220K OHMS | R10 R11 R179 R181 |
| 410033 | 330K OHMS | R39 |
| 410030 | 470K OHMS | R40 R180 R182 |
| 410045 | 680K OHMS | R88 |
| 410058 | 1 M OHM | R25 |
| 410059 | 10 M OHMS | R42 |

## MISCELLANOUS RESISTORS

| | | |
|---|---|---|
| 410159 | 2 OHMS 1W 5% | R141 |
| 410168 | 2.4 OHM 5W WW | R1 R2 |
| 410108 | 220 OHMS 1/2W | R13 |
| 410144 | 8.25K OHMS 1/4W 1% | R81 |
| 410086 | 20.0K OHMS 1/4W 1% | R50-R57 R80 R82 R85 R90 R103 R104 R105 R107 |
| 410105 | 47.5K OHMS 1/4W 1% | R83 R84 |

## CAPACITORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 150098 | 22PF 50V 10% | C20 C21 C80 C89 |
| 150026 | 39PF DISC 5% | C36 C65 |
| 150041 | 47PF DISC 10% | C94 C97 |
| 150006 | 100PF DISC 10% | C30 C40 C41 C48 C49 C57 |
| 150007 | 200PF DISC 10% | C66 C79 |
| 150074 | 220PF MONO 10% | C44 C53 |
| 150014 | 470PF DISC 10% | C26 C29 C67 C68 |
| 150102 | 470PF 50V 20% | C156 C157 |
| 150094 | 680PF 50V 5% | C33 |
| 150101 | 820PF 50V 5% NPO | C59 |
| 150052 | .001UF 30V DISC 10% | C23 C24 C25 C84 |
| 150108 | .0022UF 50V MONO 10% | C62 |
| 150114 | .0047UF 50V MYLAR 5% | C17 C34 C55 |
| 150012 | .01UF 30V DISC | C35 C144 C145 C147-C154 C9 |
| 150112 | .1UF 100V MONO 20% | C4 C11 C13 C14 C15 C16 C19 C22 C43 C52 C56 C58 C74 C75 C77 C78 C83 C85 C87 C108 C111-C135 C160 C161 C166 C8 |
| 150029 | .01UF 1.4 KVDC DISC | C109 |
| 150008 | .022UF MYLAR 10% | C100 C101 |
| 150131 | .047UF 100V 5% | C32 C54 C63 C64 |
| 150003 | .22UF 100V MYLAR 20% | C12 C73 C91 C69 C70 |
| 150043 | .47UF 50V MONOLYTHIC | C31 C92 C136 C138 C139 C142 C76 C143 C147 C27 C42 C50 C51 C71 C72 |
| 150002 | 1UF 50V NP ELECT. | C28 C38 C39 C46 C47 C61 C158 C159 |
| 150073 | 1UF 50V MONO 10% | C93 C104 C105 C106 C107 C162 |
| 150044 | 4.7UF 35V TANT. | C10 C82 |
| 150087 | 4.7UF 50V ELECT. | C60 |
| 150072 | 10UF 25V NP | C137 C140 C141 C158 |
| 150064 | 10UF 50V ELECT. | C88 C7 |
| 150088 | 10UF 50V NP ELECT. | C37 C45 C98 C99 |
| 150010 | 22UF 16V ELECT. | C81 C90 C95 C96 |
| 150100 | 47UF 16V ELECT. | C5 C18 C163 C164 C167 C168 |
| 150081 | 47UF 35V ELECT. | C155 |
| 150020 | 220UF 25V ELECT. | C110 |
| 150021 | 220UF 35V ELECT. | C6 C165 |
| 150092 | 1000UF 35V ELECT. | C86 |
| 150135 | 2200UF 50V ELECT. | C2 C3 |
| 150126 | 4700UF 25V ELECT. | C1 |

## DIODES

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480026 | 1N957B ZENER DIODE 6.8V 5% .4W | D9 |
| 480001 | 1N4001 RECTIFIER DIODE | D10 D11 D15 D16 D28 D37 D38 D44 D45 |
| 480000 | 1N4148 SIGNAL DIODE | D12 D13 D14 D17 D18 D19 D20 D29-D36 D39-D43 |
| 480005 | 1N5401 RECT. DIODE 3A 100PIV | D1-D8 |

## TRANSISTORS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480006 | 2N2222 TRANSISTOR | Q1 Q3 Q5 |
| 480069 | 2N5639 N CHANNEL JFET | Q6 |
| 480050 | MPS-A55 TRANSISTOR | Q4 |

## INTEGRATED CIRCUITS

| CC P/N | DESCRIPTION | REF DESIGNATORS |
|---|---|---|
| 480076 | 4049B CMOS HEX INVERT BUFFER | IC22 |
| 480107 | 4094 CMOS 8 BIT SHIFT REGISTER | IC26 |
| 480165 | 4514 CMOS 4-16 LINE DECODER | IC23 |
| 480090 | 4584B CMOS HEX SCHMITT TRIG | IC3 |
| 480117 | 6264 CMOS 8K X 8 STATIC RAM | IC6 |
| 480132 | 68HC11AOFN MCU 52 PIN PLCC | IC1 |
| 480157 | 74HC00 QUAD NAND | IC7 |
| 480120 | 74HC138 CMOS 3 TO 8 LINE DECODER | IC8 |
| 480142 | 74HC373 CMOS TRISTATE OCTAL LATCH | IC4 |
| 480083 | 7805T +5 VOLT REGULATOR TO220 PKG | VR1 VR5 |
| 480092 | DG211CJ QUAD CMOS ANALOG SWITCH | IC29 IC30 IC31 |
| 480167 | LM317T 1.5A ADJ VR TO-220 | VR3 VR2 |
| 480166 | LM339N QUAD COMPARATOR | IC25 IC24 |
| 480024 | LM340-15 +15V REGULATOR | VR4 |
| 480012 | LM384 IC POWER OP AMP | IC28 |
| 480070 | NE5532 DUAL LO NOISE OP AMP | IC14-IC17 IC19-IC21 IC10 IC12 |
| 480134 | TL7705AP VOLT SUPERVISOR/RESET | IC9 |
| 480164 | UCN5821A 8 BIT SHIFT REG/DRIVERS | IC27 |
| 480168 | SSM 2024P QUAD VCA | IC18 IC13 |
| 480105 | X2404/512B (XICOR) SERIAL NVM | IC2 |
| 480175 | LM 833N DUAL OP AMP 8 PIN DIP | IC11 |

## MISCELLANY

| | | |
|---|---|---|
| 230001 | CRYSTAL 3.57545 MHZ HC18/U | Y1 |
| 450007 | DPDT 12V RELAY ITT#RZ-12W-C | RLY1 RLY2 |
| 470022 | 5K TRIMPOT H MTG. | P2 P1 |
| 510078 | 8 POS DIP SWITCH | S3 |
| 560018 | 600CT/600CT TRANSFORMER | T2 T1 |
| 710233 | EPROM ASSEMBLY | IC5 |

(480156 pre-burn)

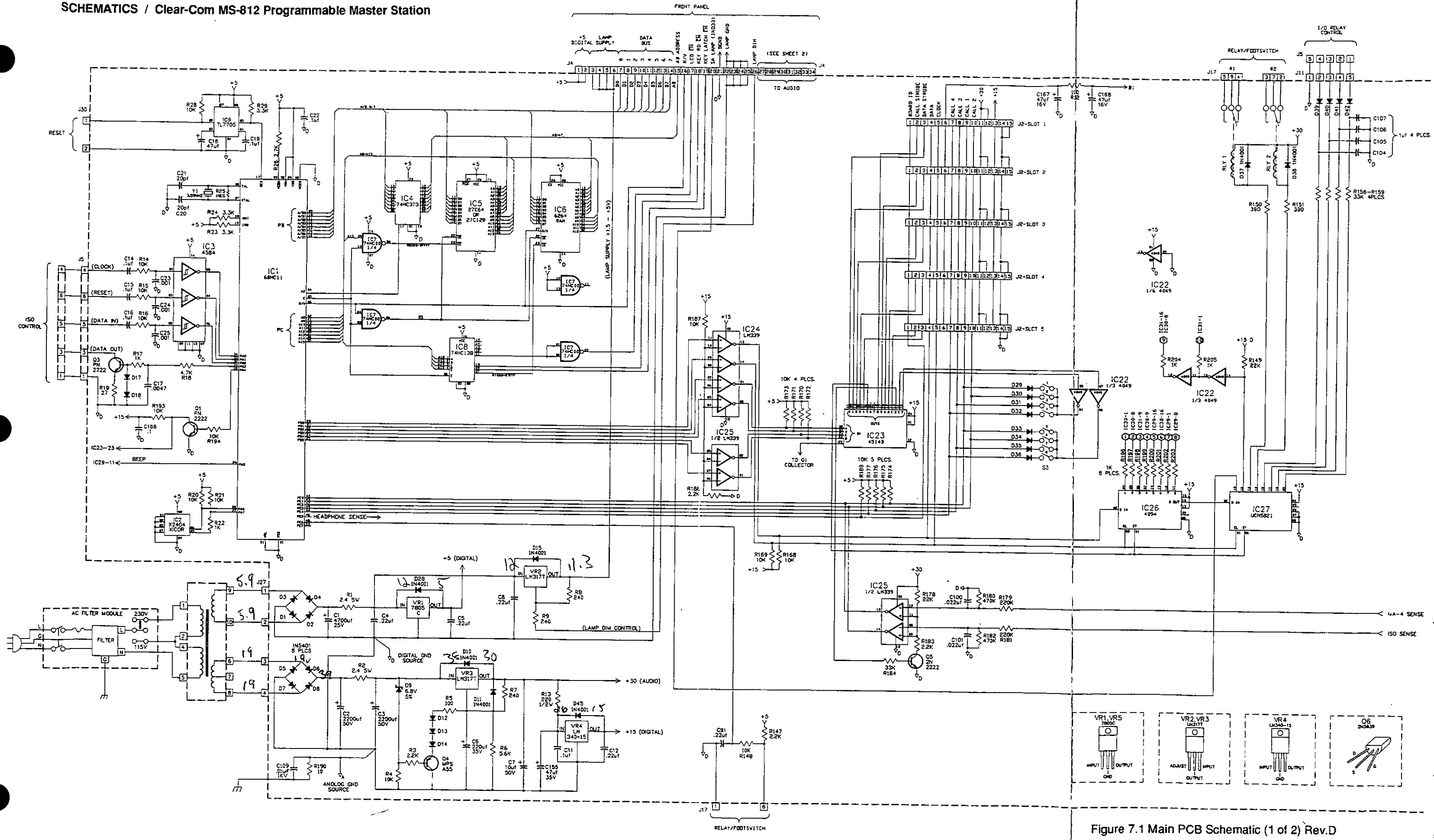



Figure 7.1 Main PCB Schematic (1 of 2) Rev.D

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL IC's ARE NE5532
2. IC13 AND IC18 ARE SSM2024
3. ALL DIODES ARE 1N4148.
4. ALL RESISTORS ARE 1/4W 5%, LISTED IN OHMS

REFERENCE DESIGNATORS

| | LAST USED | NOT USED |
|---|---|---|
| C | 168 | 102,103 |
| D | 45 | D21-D27 |
| IC | 31 | |
| P | 2 | |
| Q | 6 | Q2 |
| R | 210 | 48,49 152,153,154,155 |
| RL | 2 | |
| S | 3 | 1,2 |
| T | 2 | |
| VR | 5 | |
| Y | 1 | |

Figure 7.2 Main PCB Schematic (2 of 2) Rev.B

SHEET 2 OF 2

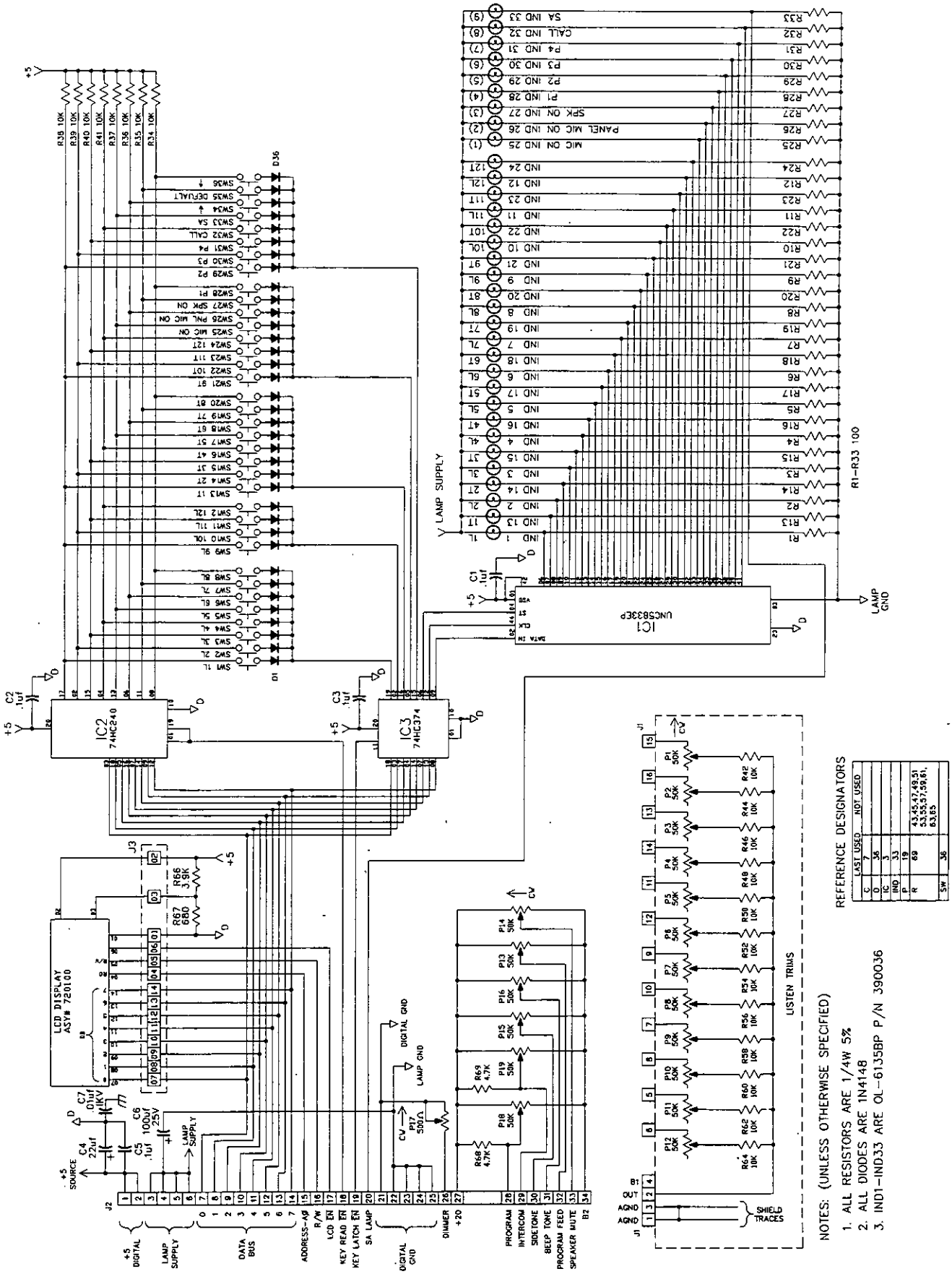
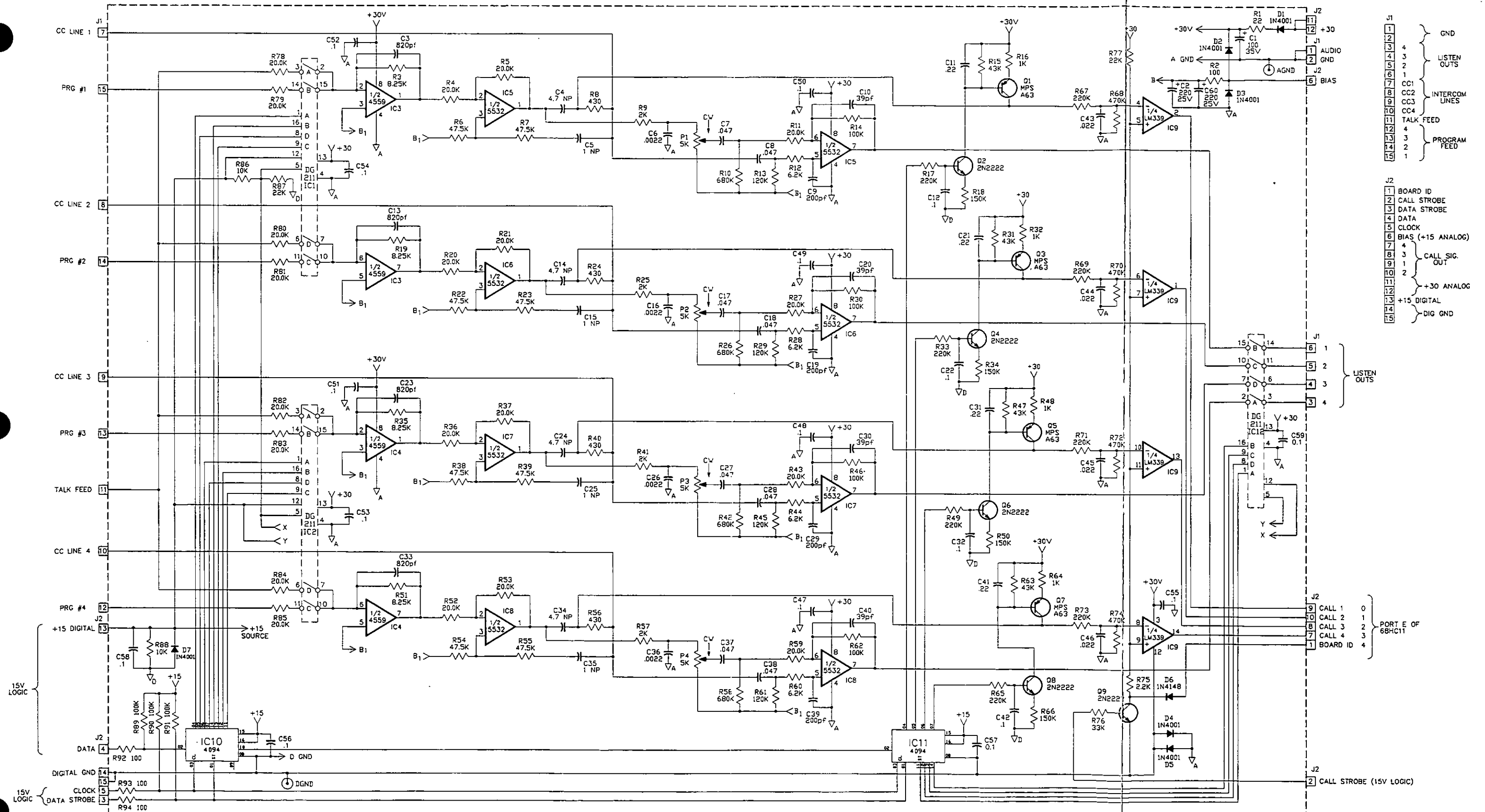



Figure 7.3 Front Panel PCB Schematic Rev.A

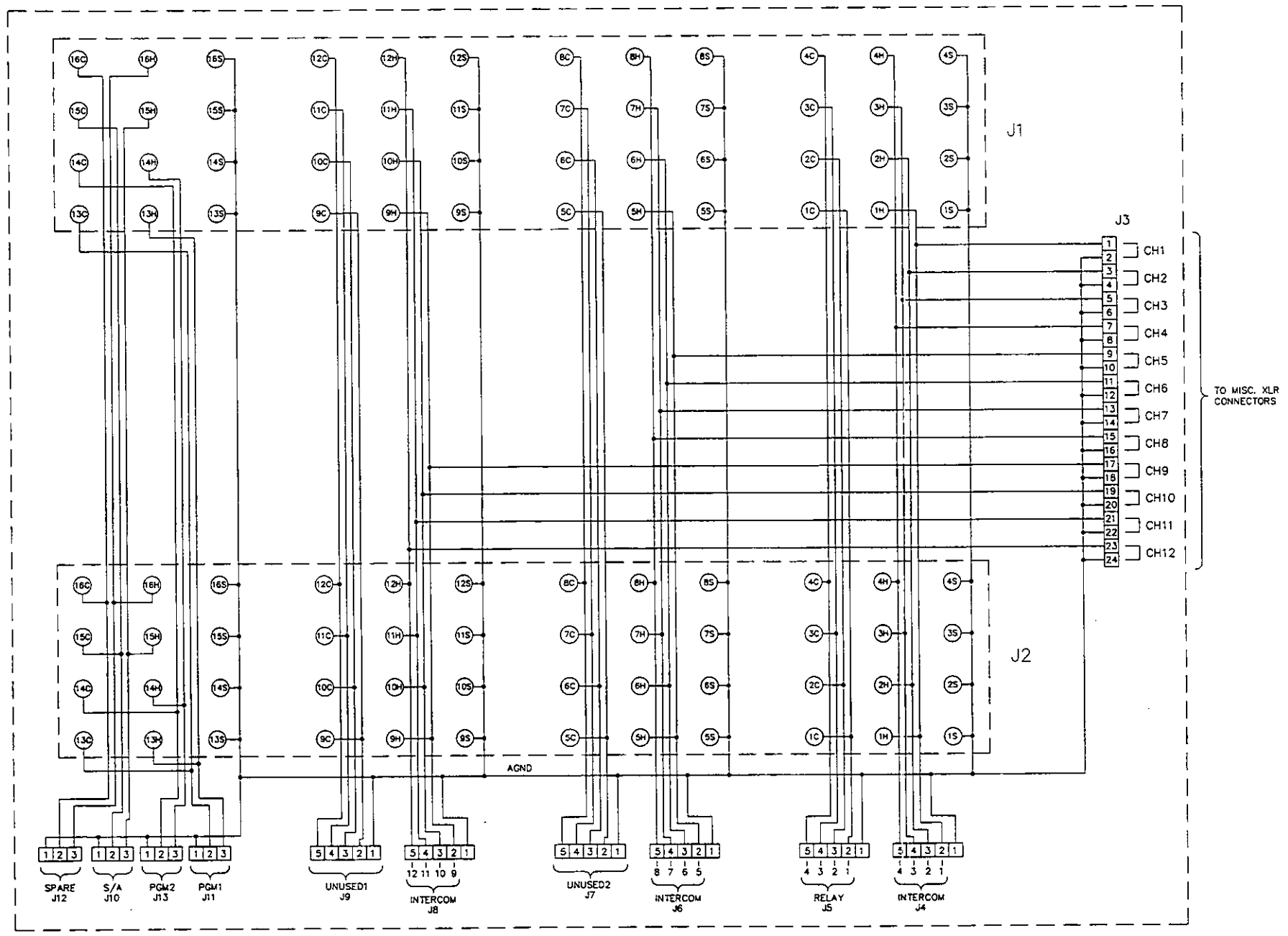



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL RESISTORS ARE 1/4W 5%, LISTED IN OHMS.
2. ALL CAPACITORS ARE IN uF.

| DESIGNATOR | LAST | NOT USED |
|---|---|---|
| IC | IC12 | |
| Q | Q9 | |
| D | D7 | |
| R | R94 | |
| C | C60 | |
| J | J2 | |

Figure 7.4 Amp Module Schematic Rev.A




PINOUT FOR ELCO 8016-056

Rear view of female conn.
(Recessed contacts)

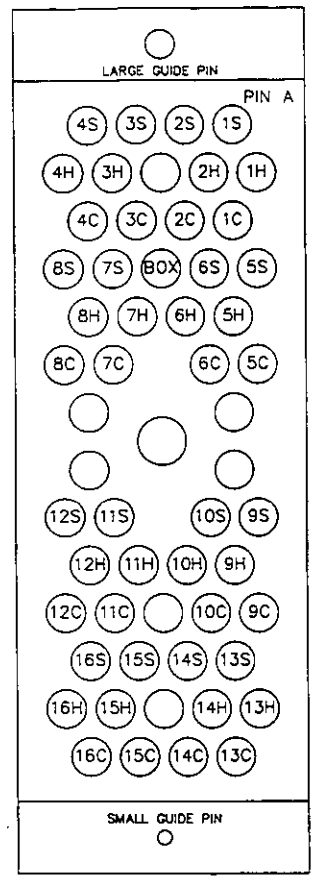



Figure 7.5 ELCO Module Schematic Rev.A

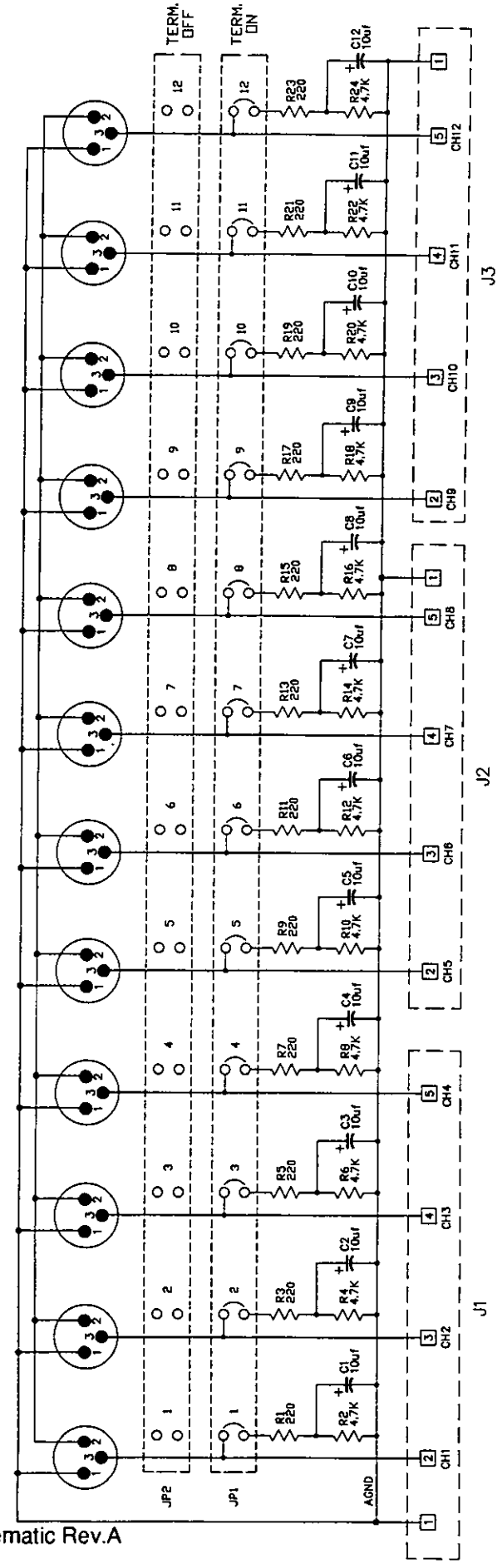



Figure 7.6 XLR Module Schematic Rev.A

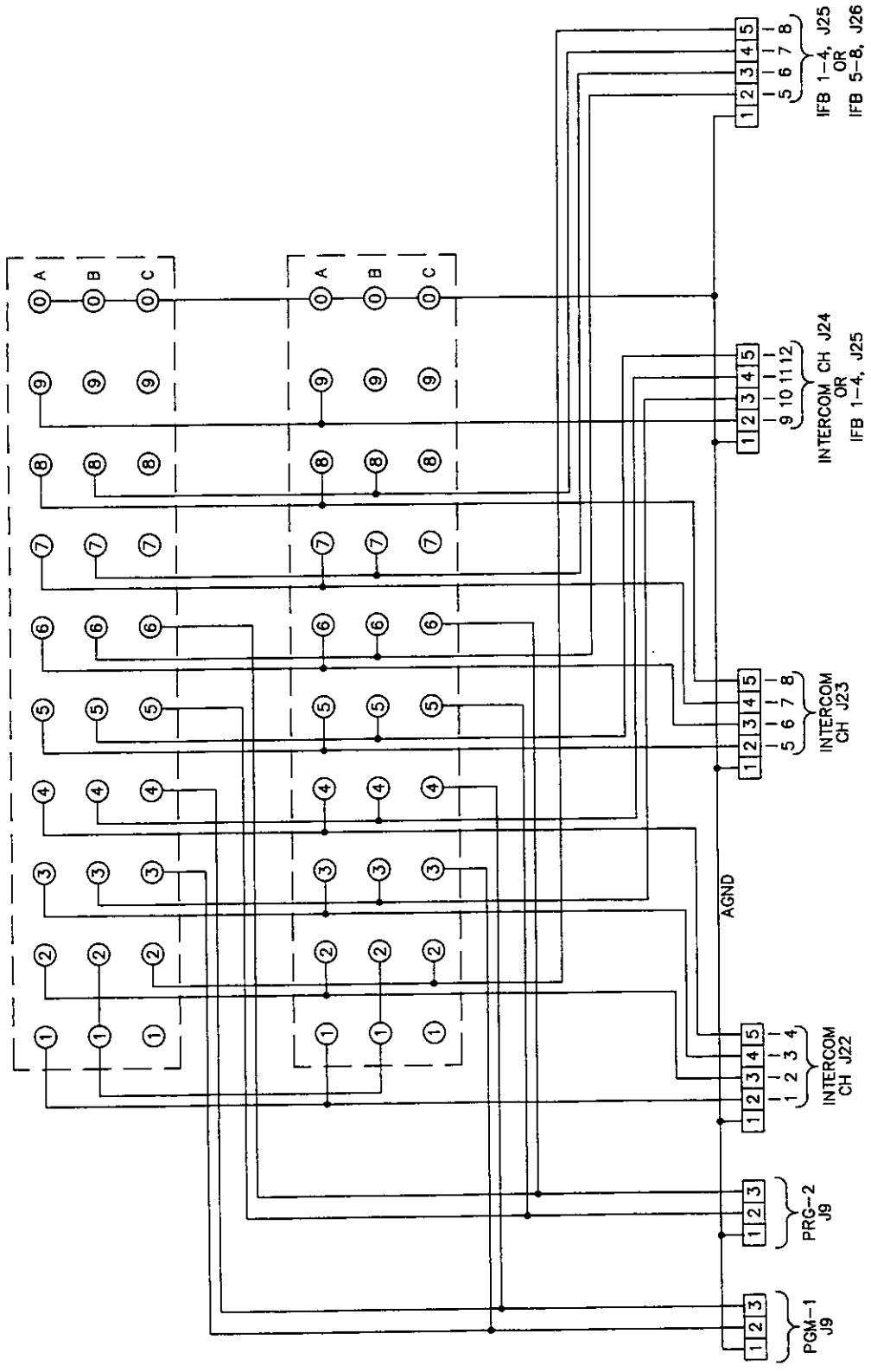
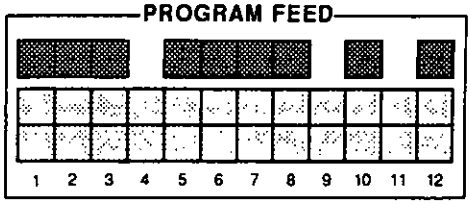



Figure 7.7 Tuchel Module Schematic Rev.B

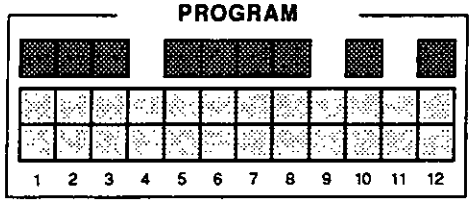
# Clear-Com Intercom Systems MS-812 PROGRAMMING WORKSHEET

## LOCAL PROGRAM / INTERRUPT

PROGRAM FEED

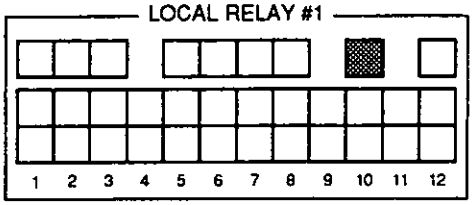



PROGRAM

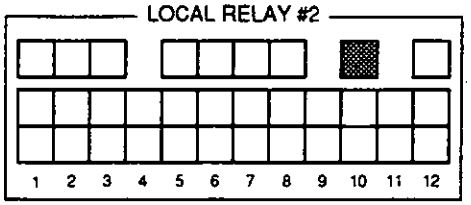



## RELAYS

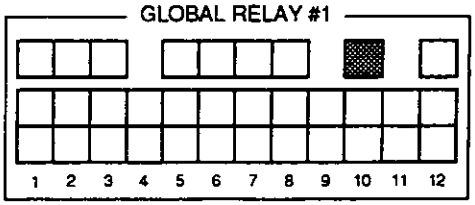
LOCAL RELAY #1



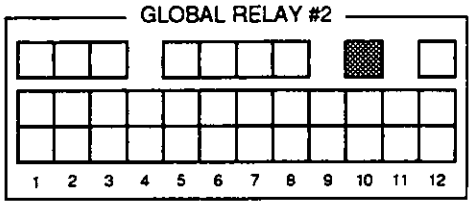

LOCAL RELAY #2



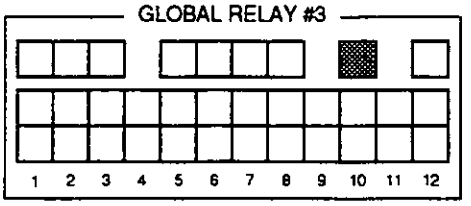

GLOBAL RELAY #1



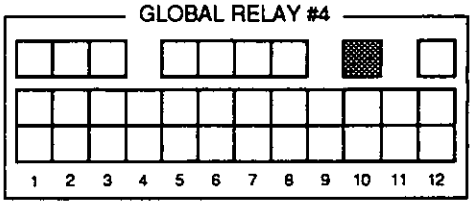

GLOBAL RELAY #2




GLOBAL RELAY #3

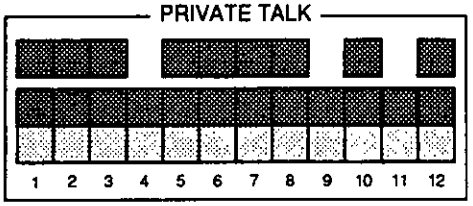



GLOBAL RELAY #4

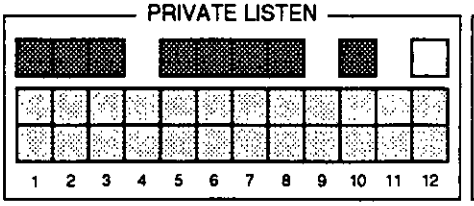



## BUTTON FUNCTIONS

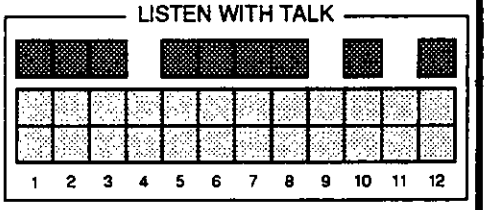
PRIVATE TALK



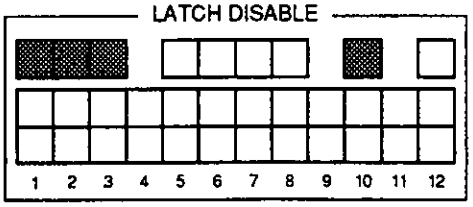

PRIVATE LISTEN



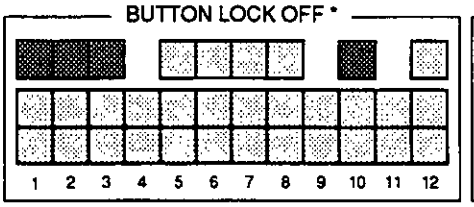

LISTEN WITH TALK



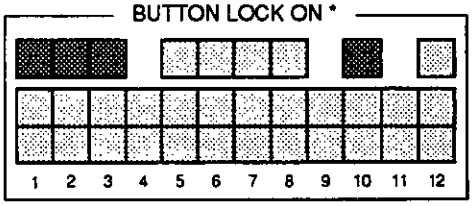

LATCH DISABLE



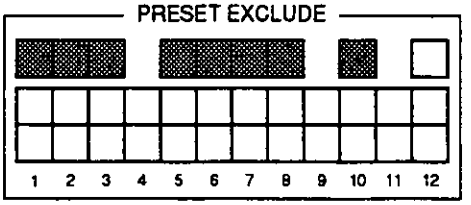

BUTTON LOCK OFF *




BUTTON LOCK ON *



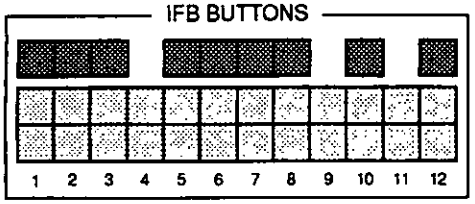

PRESET EXCLUDE



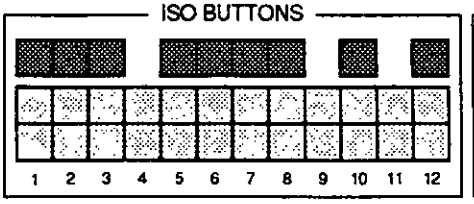

** Note: Button Lock ON & OFF are interactive. If a button is locked ON, it becomes "not available to be locked OFF, and visa-versa.*

## IFB/ISO

IFB BUTTONS




ISO BUTTONS




ISO STATION #

*(Station #0-6)*

*(Use **SA** button to select)*

ISO 1st CH. #

*(Channel #1-15)*

*(Use **SA** button to select)*

Clear Com form F0015-2

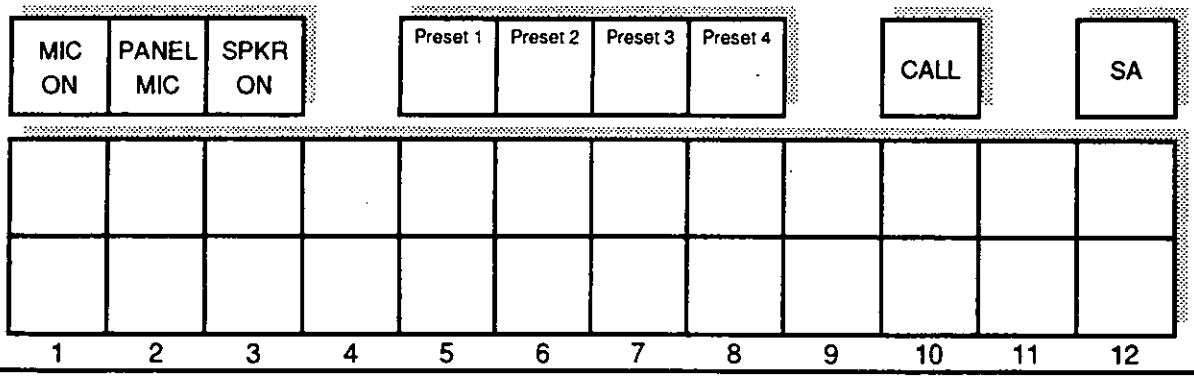
# Clear-Com Intercom Systems — MS-812 PROGRAMMING WORKSHEET

JOB / SHOW: ..... DATE: .....

STATION NAME / ..... STATION #: .....

SETUP NAME: ..... SETUP #: .....

*INSTRUCTIONS: Fill in PRESET, INTERCOM, IFB, ISO & RELAY button designations.*

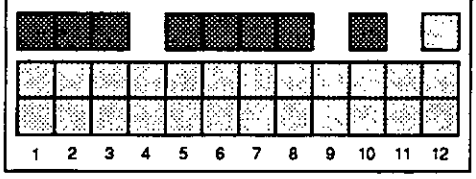



*INSTRUCTIONS: Check off button(s) to be included in function.* ***Bold*** *functions are "Basic Menu" functions.*

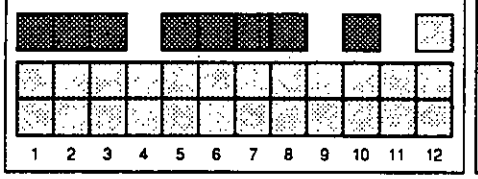
- *Non-shaded buttons are always available in the functions.*
- *Dark-shaded buttons are never available in function.*
- *Light-shaded button availibility changes based on other programmed functions.*

## PRESET / FOOTSWITCH

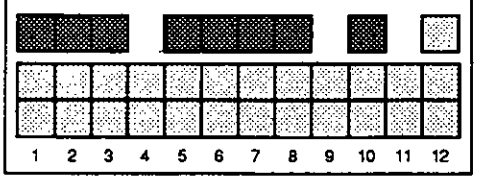
### PRESET #1



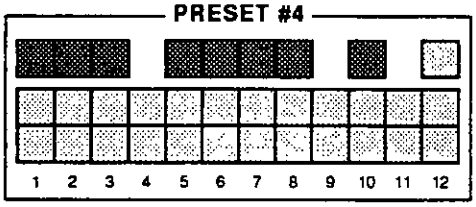

### PRESET #2




### PRESET #3




### PRESET #4




### PRESET OPERATION MODE

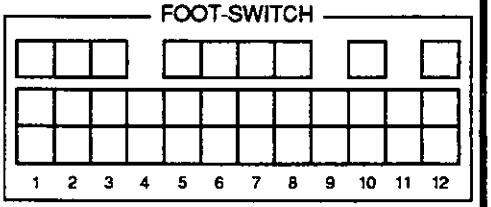
INTERLOCK..... ☐

*or*

ADDITIVE..... ☐

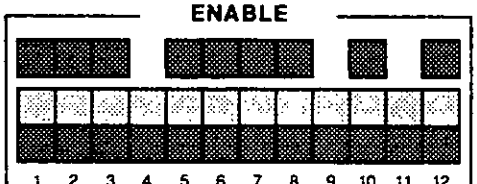
*(Use* ***SA*** *button to select)*

### FOOT-SWITCH

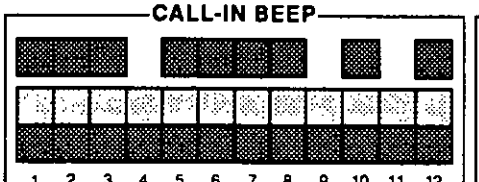



## CALL-SIGNAL

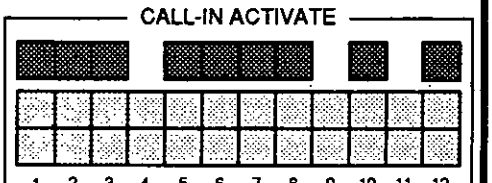
### ENABLE




### CALL-IN BEEP




### CALL-IN ACTIVATE



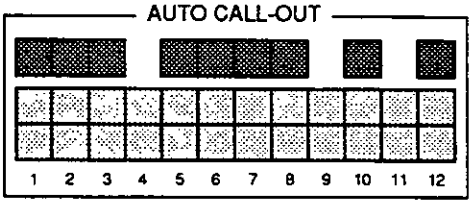

### CALL-IN TIME

(Amount of time button continues to flash after incoming call signal is removed)

5s, 20s, 1m, 15m, 30m. ☐

*(Use* ***SA*** *button to select)*

### AUTO CALL-OUT




Clear Com form F0015-1

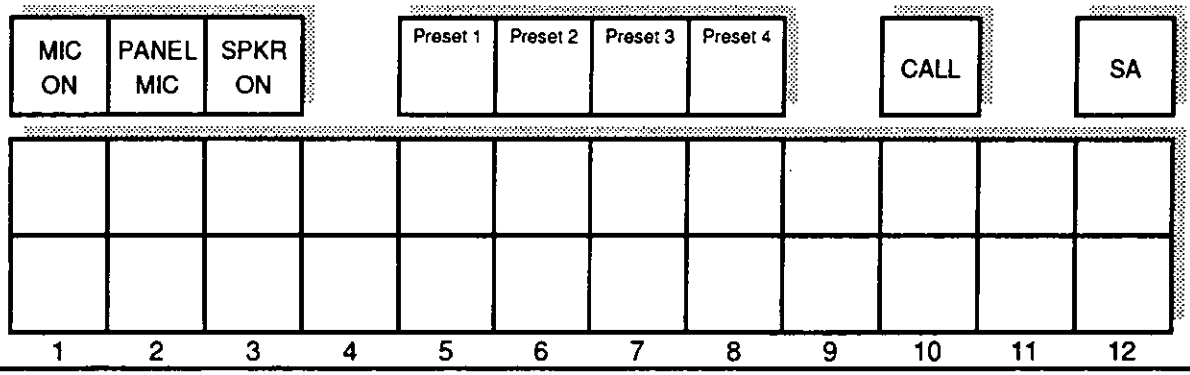
# Clear-Com Intercom Systems MS-812 PROGRAMMING WORKSHEET

JOB / SHOW: ..... DATE: .....

STATION NAME / ..... STATION #: .....

SETUP NAME: ..... SETUP #: .....

*INSTRUCTIONS: Fill in PRESET, INTERCOM, IFB, ISO & RELAY button designations.*



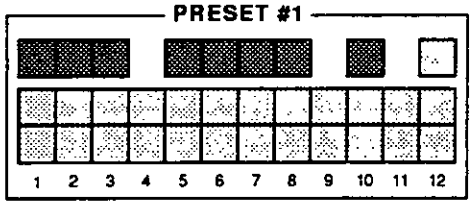

*INSTRUCTIONS: Check off button(s) to be included in function.* ***Bold*** *functions are "Basic Menu" functions.*

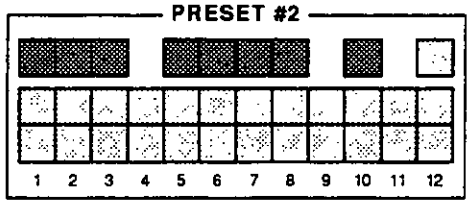
*Non-shaded buttons are always available in the functions.*

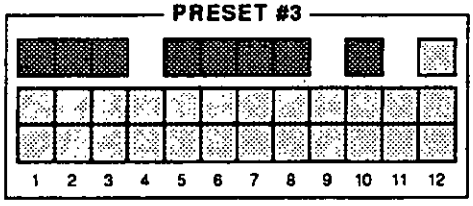
*Dark-shaded buttons are never available in function.*

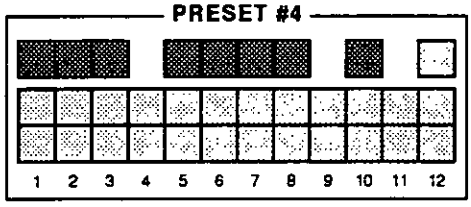
*Light-shaded button availibility changes based on other programmed functions.*

## PRESET / FOOTSWITCH



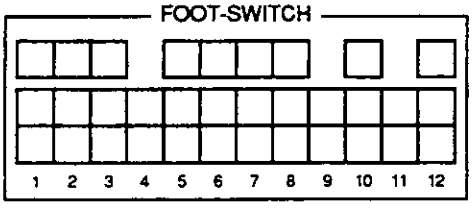

PRESET OPERATION MODE

INTERLOCK..... ☐

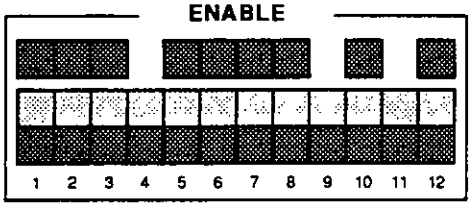
*or*

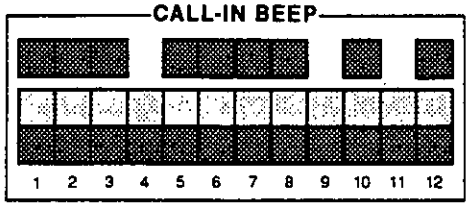
ADDITIVE..... ☐

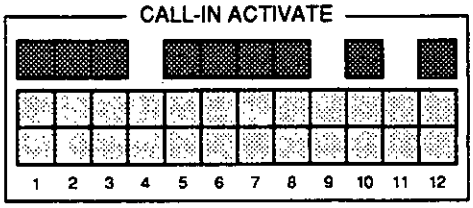
*(Use* ***SA*** *button to select)*




## CALL-SIGNAL



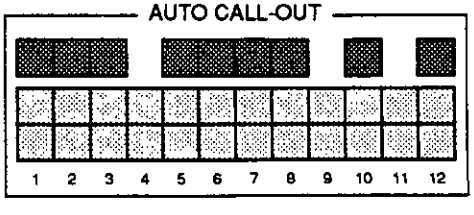




CALL-IN TIME

(Amount of time button continues to flash after incoming call signal is removed)

5s, 20s, 1m, 15m, 30m. ☐

*(Use* ***SA*** *button to select)*

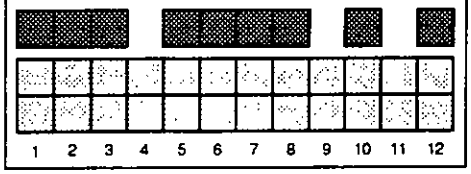



Clear Com form F0015-1

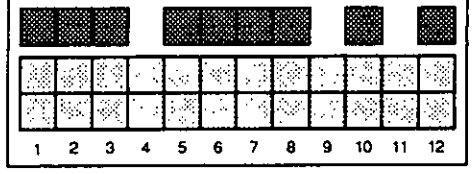
# Clear-Com Intercom Systems MS-812 PROGRAMMING WORKSHEET

## LOCAL PROGRAM / INTERRUPT

PROGRAM FEED

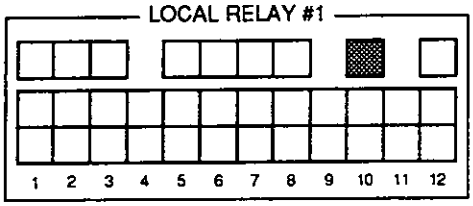



PROGRAM

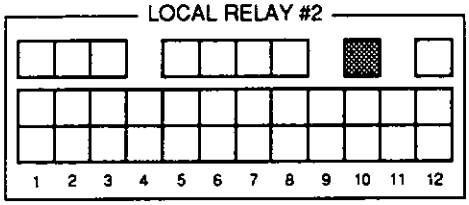



## RELAYS

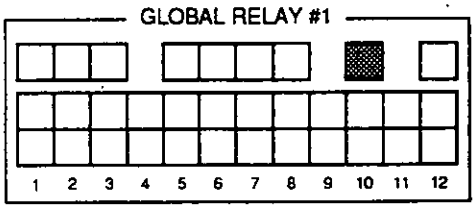
LOCAL RELAY #1



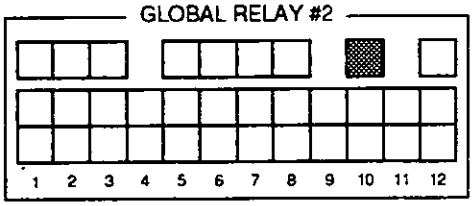

LOCAL RELAY #2



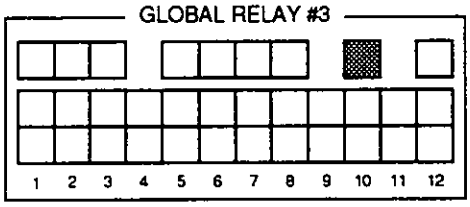

GLOBAL RELAY #1



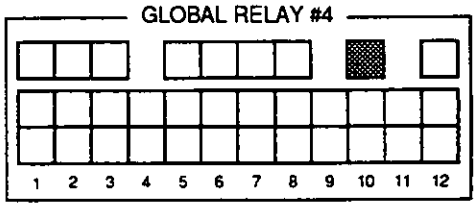

GLOBAL RELAY #2




GLOBAL RELAY #3

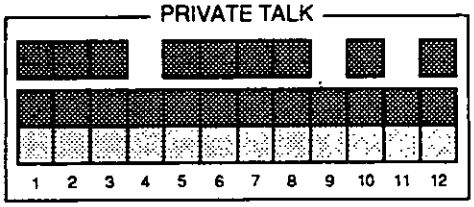



GLOBAL RELAY #4

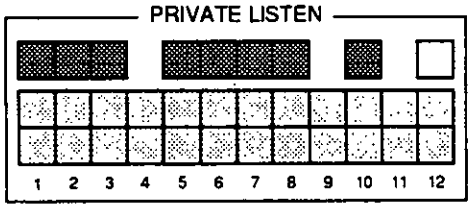



## BUTTON FUNCTIONS

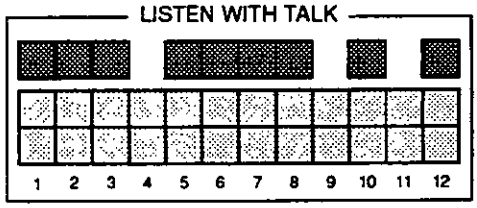
PRIVATE TALK



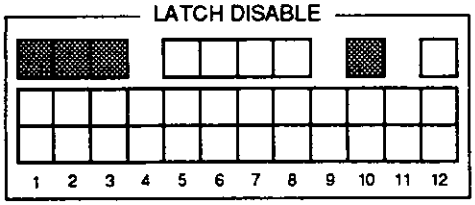

PRIVATE LISTEN



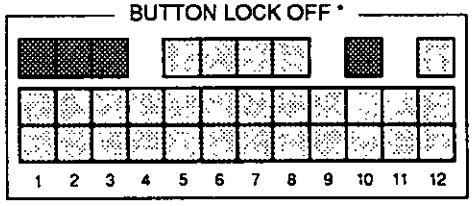

LISTEN WITH TALK



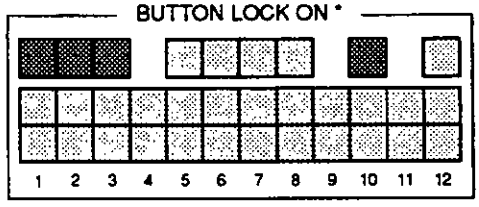

LATCH DISABLE



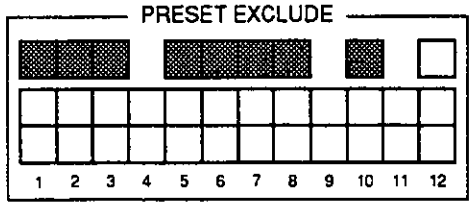

BUTTON LOCK OFF *




BUTTON LOCK ON *



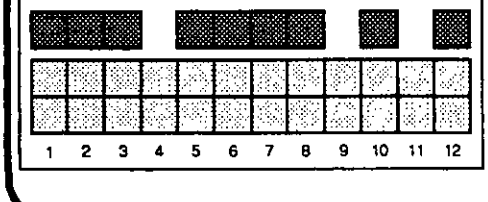

PRESET EXCLUDE



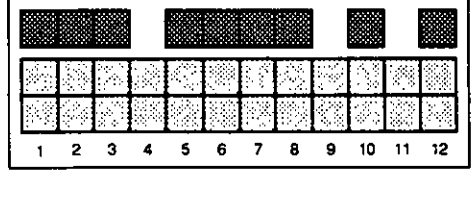

** Note: Button Lock ON & OFF are interactive. If a button is locked ON, it becomes "not available to be locked OFF, and visa-versa.*

## IFB/ISO

IFB BUTTONS




ISO BUTTONS




ISO STATION #

*(Station #0-6)*

*(Use **SA** button to select)*

ISO 1st CH. #

*(Channel #1-15)*

*(Use **SA** button to select)*

Clear Com form F001512

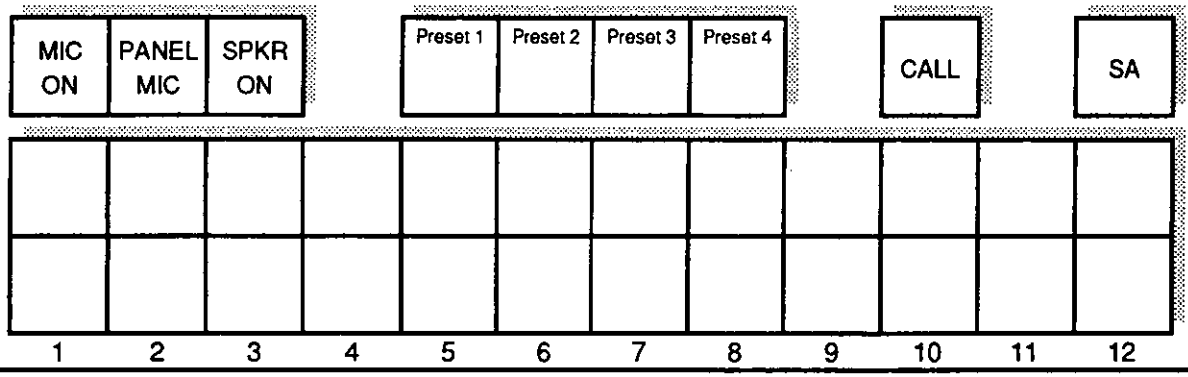
# Clear-Com Intercom Systems MS-812 PROGRAMMING WORKSHEET

JOB / SHOW: ..... DATE: .....

STATION NAME / ..... STATION #: .....

SETUP NAME: ..... SETUP #: .....

*INSTRUCTIONS: Fill in PRESET, INTERCOM, IFB, ISO & RELAY button designations.*




*INSTRUCTIONS: Check off button(s) to be included in function.* ***Bold*** *functions are "Basic Menu" functions.*

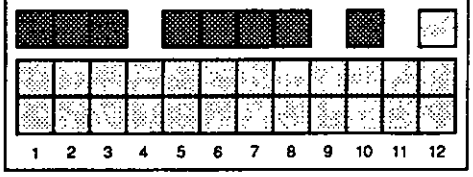
*Non-shaded buttons are always available in the functions.*

*Dark-shaded buttons are never available in function.*

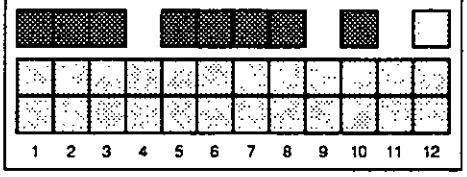
*Light-shaded button availibility changes based on other programmed functions.*

## PRESET / FOOTSWITCH

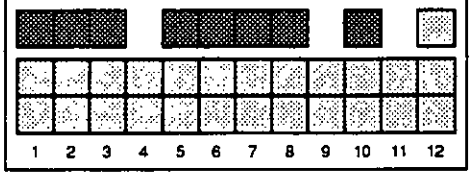
### PRESET #1



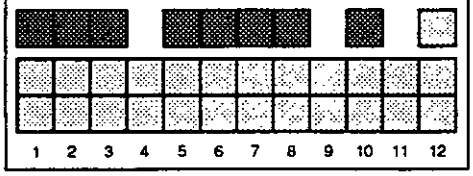

### PRESET #2




### PRESET #3




### PRESET #4




### PRESET OPERATION MODE

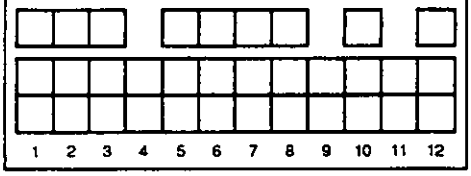
INTERLOCK..... ☐

*or*

ADDITIVE..... ☐

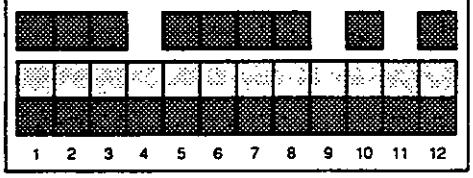
*(Use* ***SA*** *button to select)*

### FOOT-SWITCH

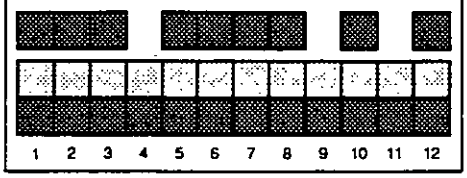



## CALL-SIGNAL

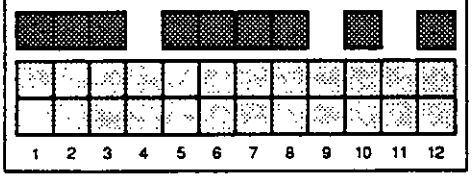
### ENABLE




### CALL-IN BEEP




### CALL-IN ACTIVATE



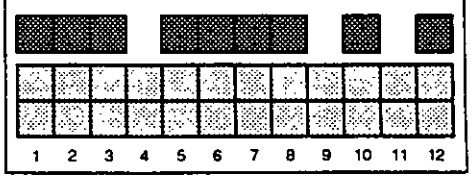

### CALL-IN TIME

(Amount of time button continues to flash after incoming call signal is removed)

5s, 20s, 1m, 15m, 30m. ☐

*(Use* ***SA*** *button to select)*

### AUTO CALL-OUT

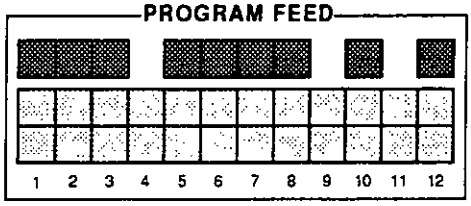



Clear Com form F0015-1

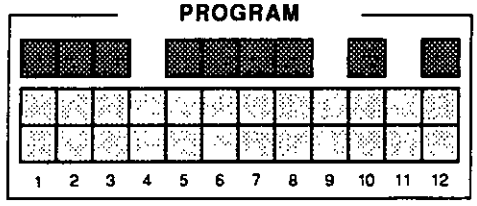
# Clear-Com Intercom Systems MS-812 PROGRAMMING WORKSHEET

## LOCAL PROGRAM / INTERRUPT

PROGRAM FEED

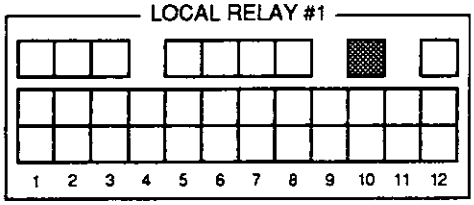



PROGRAM

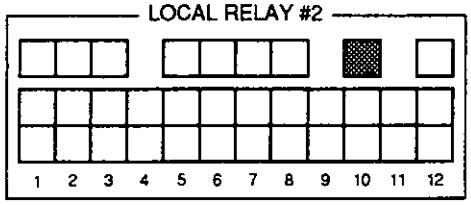



## RELAYS

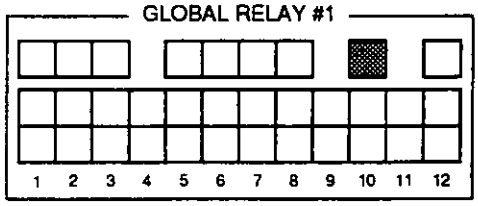
LOCAL RELAY #1



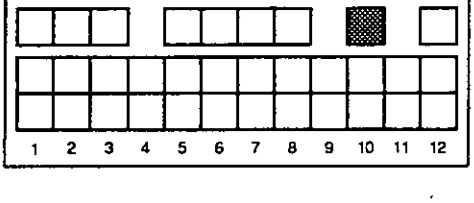

LOCAL RELAY #2



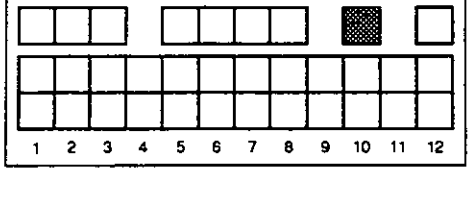

GLOBAL RELAY #1



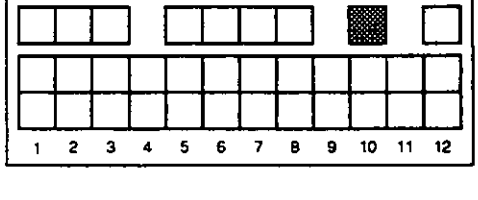

GLOBAL RELAY #2




GLOBAL RELAY #3

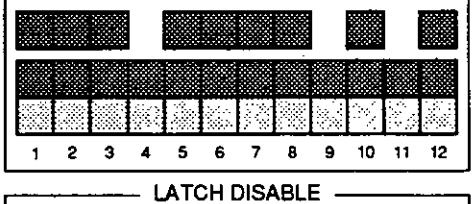



GLOBAL RELAY #4

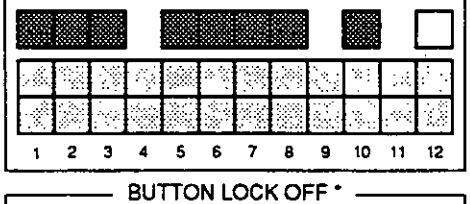



## BUTTON FUNCTIONS

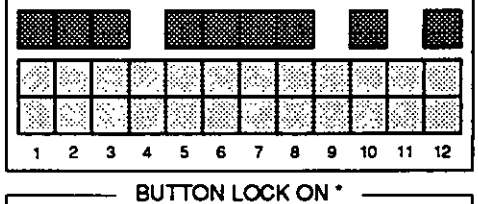
PRIVATE TALK



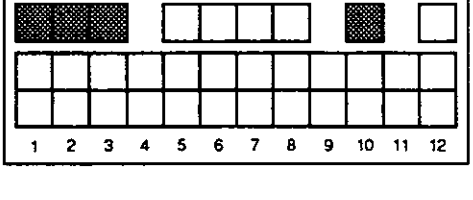

PRIVATE LISTEN



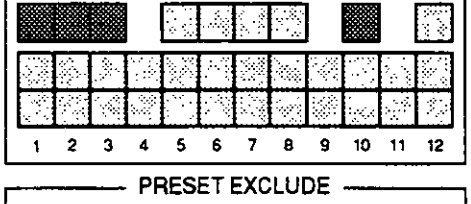

LISTEN WITH TALK



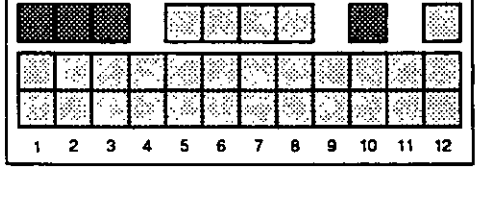

LATCH DISABLE



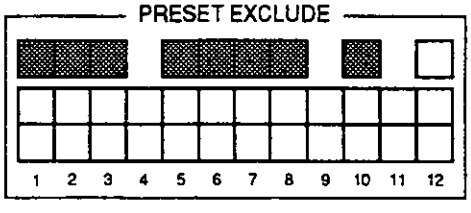

BUTTON LOCK OFF *




BUTTON LOCK ON *



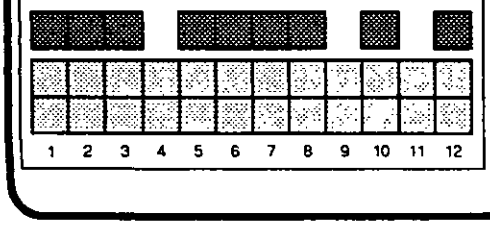

PRESET EXCLUDE



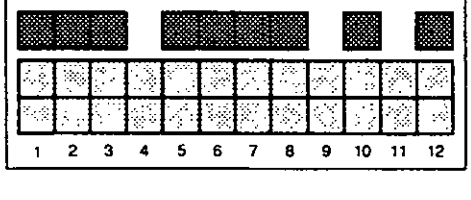

** Note: Button Lock ON & OFF are interactive. If a button is locked ON, it becomes "not available to be locked OFF, and visa-versa.*

## IFB/ISO

IFB BUTTONS




ISO BUTTONS




ISO STATION #

*(Station #0-6)*

*(Use **SA** button to select)*

ISO 1st CH. #

*(Channel #1-15)*

*(Use **SA** button to select)*

Clear Com form F0015-2

# Clear-Com Intercom Systems — MS-812 PROGRAMMING WORKSHEET

JOB / SHOW: ..... DATE: .....

STATION NAME / ..... STATION #: .....

SETUP NAME: ..... SETUP #: .....

*INSTRUCTIONS: Fill in PRESET, INTERCOM, IFB, ISO & RELAY button designations.*

| MIC ON | PANEL MIC | SPKR ON | Preset 1 | Preset 2 | Preset 3 | Preset 4 | CALL | SA |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

1 2 3 4 5 6 7 8 9 10 11 12

*INSTRUCTIONS: Check off button(s) to be included in function.* ***Bold*** *functions are "Basic Menu" functions.*

- *Non-shaded buttons are always available in the functions.*
- *Dark-shaded buttons are never available in function.*
- *Light-shaded button availibility changes based on other programmed functions.*

## PRESET / FOOTSWITCH

**PRESET #1** — 1 2 3 4 5 6 7 8 9 10 11 12

**PRESET #2** — 1 2 3 4 5 6 7 8 9 10 11 12

**PRESET #3** — 1 2 3 4 5 6 7 8 9 10 11 12

**PRESET #4** — 1 2 3 4 5 6 7 8 9 10 11 12

PRESET OPERATION MODE

INTERLOCK..... ☐

*or*

ADDITIVE..... ☐

*(Use* ***SA*** *button to select)*

FOOT-SWITCH — 1 2 3 4 5 6 7 8 9 10 11 12

## CALL-SIGNAL

**ENABLE** — 1 2 3 4 5 6 7 8 9 10 11 12

**CALL-IN BEEP** — 1 2 3 4 5 6 7 8 9 10 11 12

**CALL-IN ACTIVATE** — 1 2 3 4 5 6 7 8 9 10 11 12

CALL-IN TIME

(Amount of time button continues to flash after incoming call signal is removed)

5s, 20s, 1m, 15m, 30m. ☐

*(Use* ***SA*** *button to select)*

AUTO CALL-OUT — 1 2 3 4 5 6 7 8 9 10 11 12

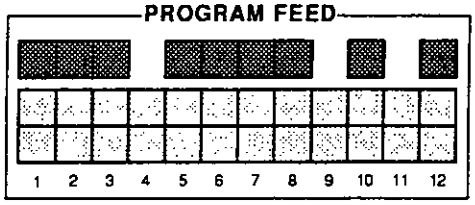
Clear Com form F0015-1

Clear-Com Intercom Systems

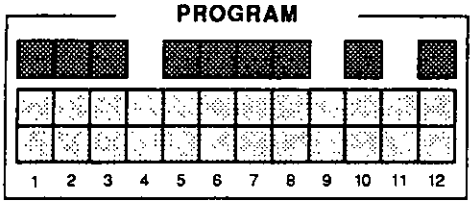
# MS-812 PROGRAMMING WORKSHEET

## LOCAL PROGRAM / INTERRUPT

PROGRAM FEED

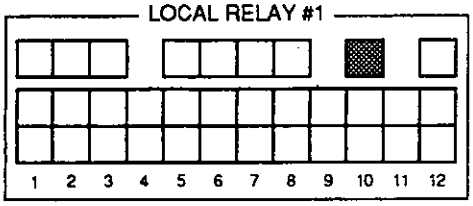



PROGRAM

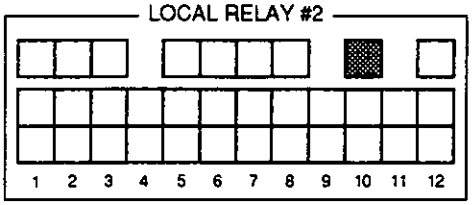



## RELAYS

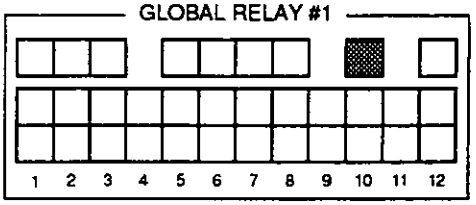
LOCAL RELAY #1



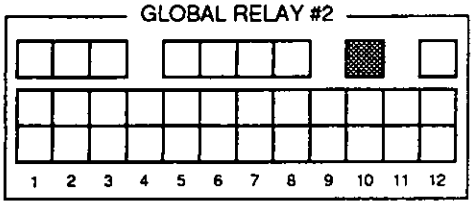

LOCAL RELAY #2



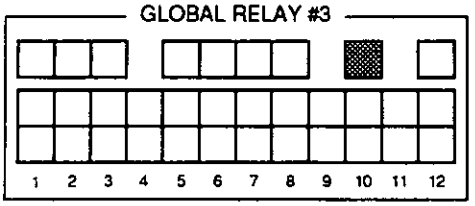

GLOBAL RELAY #1



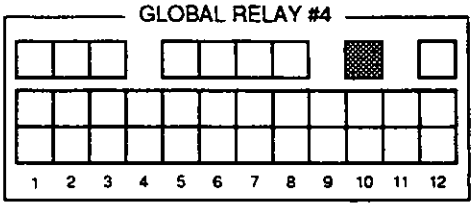

GLOBAL RELAY #2




GLOBAL RELAY #3

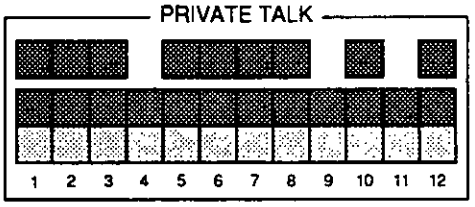



GLOBAL RELAY #4

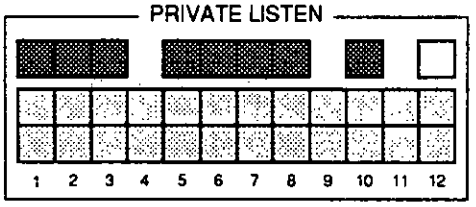



## BUTTON FUNCTIONS

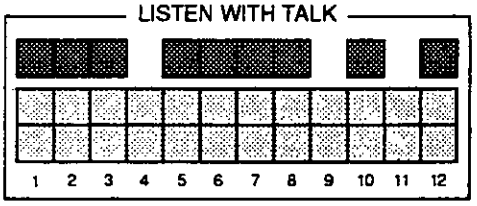
PRIVATE TALK



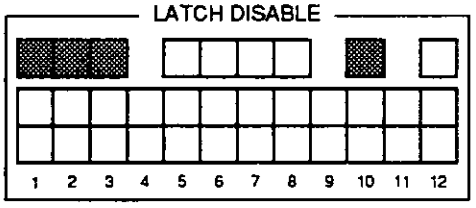

PRIVATE LISTEN



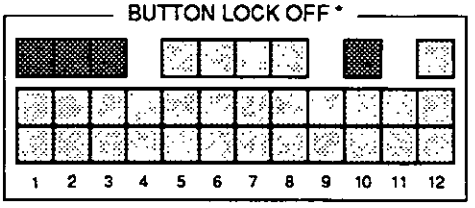

LISTEN WITH TALK



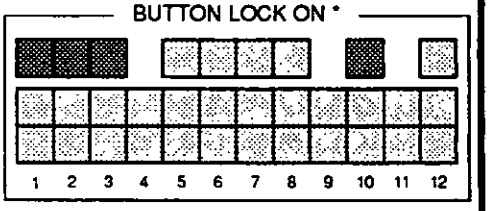

LATCH DISABLE



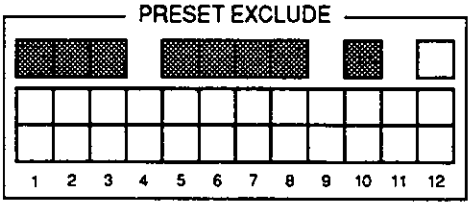

BUTTON LOCK OFF *




BUTTON LOCK ON *



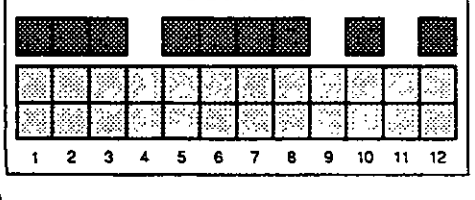

PRESET EXCLUDE



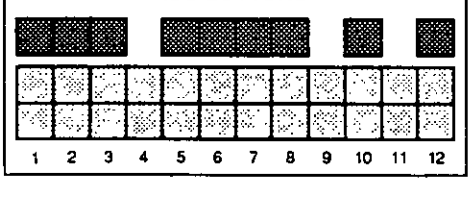

** Note: Button Lock ON & OFF are interactive. If a button is locked ON, it becomes "not available to be locked OFF, and visa-versa.*

## IFB/ISO

IFB BUTTONS




ISO BUTTONS




ISO STATION #

*(Station #0-6)*

*(Use **SA** button to select)*

ISO 1st CH. #

*(Channel #1-15)*

*(Use **SA** button to select)*

Clear Com form F0015-2

# Clear-Com Intercom Systems MS-812 PROGRAMMING WORKSHEET

JOB / SHOW: ..... DATE: .....

STATION NAME / ..... STATION #: .....

SETUP NAME: ..... SETUP #: .....

*INSTRUCTIONS: Fill in PRESET, INTERCOM, IFB, ISO & RELAY button designations.*

| MIC ON | PANEL MIC | SPKR ON | Preset 1 | Preset 2 | Preset 3 | Preset 4 | CALL | SA |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

1 2 3 4 5 6 7 8 9 10 11 12

*INSTRUCTIONS: Check off button(s) to be included in function.* ***Bold*** *functions are "Basic Menu" functions.*

*Non-shaded buttons are always available in the functions.*

*Dark-shaded buttons are never available in function.*

*Light-shaded button availibility changes based on other programmed functions.*

## PRESET / FOOTSWITCH

### PRESET #1

1 2 3 4 5 6 7 8 9 10 11 12

### PRESET #2

1 2 3 4 5 6 7 8 9 10 11 12

### PRESET #3

1 2 3 4 5 6 7 8 9 10 11 12

### PRESET #4

1 2 3 4 5 6 7 8 9 10 11 12

### PRESET OPERATION MODE

INTERLOCK..... ☐

*or*

ADDITIVE..... ☐

*(Use* ***SA*** *button to select)*

### FOOT-SWITCH

1 2 3 4 5 6 7 8 9 10 11 12

## CALL-SIGNAL

### ENABLE

1 2 3 4 5 6 7 8 9 10 11 12

### CALL-IN BEEP

1 2 3 4 5 6 7 8 9 10 11 12

### CALL-IN ACTIVATE

1 2 3 4 5 6 7 8 9 10 11 12

### CALL-IN TIME

(Amount of time button continues to flash after incoming call signal is removed)

5s, 20s, 1m, 15m, 30m. ☐

*(Use* ***SA*** *button to select)*

### AUTO CALL-OUT

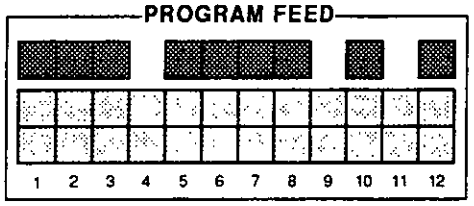
1 2 3 4 5 6 7 8 9 10 11 12

Clear Com form F0015-1

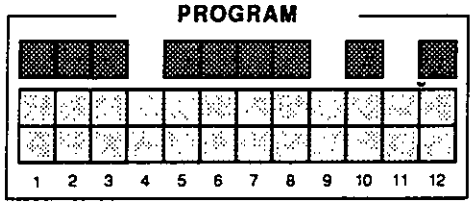
# Clear-Com Intercom Systems — MS-812 PROGRAMMING WORKSHEET

## LOCAL PROGRAM / INTERRUPT

PROGRAM FEED

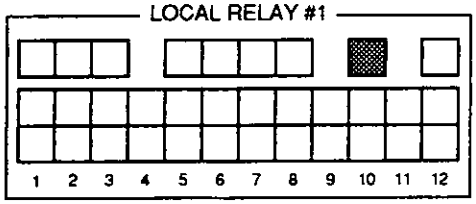



PROGRAM

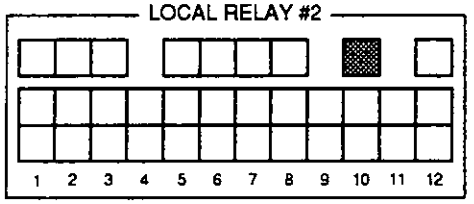



## RELAYS

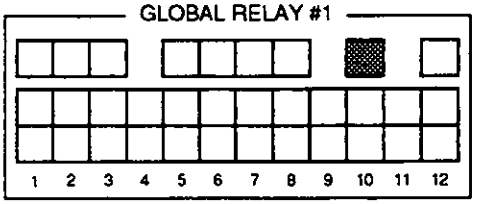
LOCAL RELAY #1



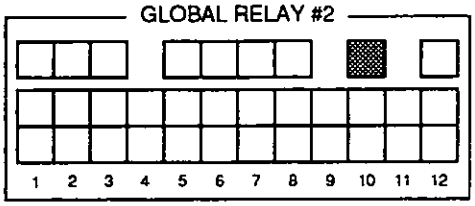

LOCAL RELAY #2



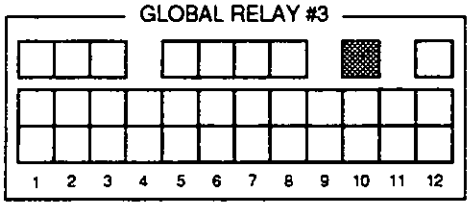

GLOBAL RELAY #1



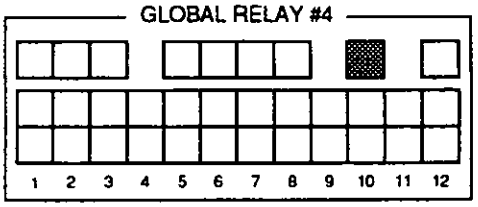

GLOBAL RELAY #2




GLOBAL RELAY #3

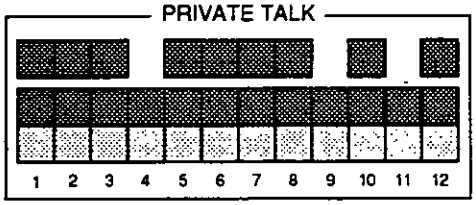



GLOBAL RELAY #4

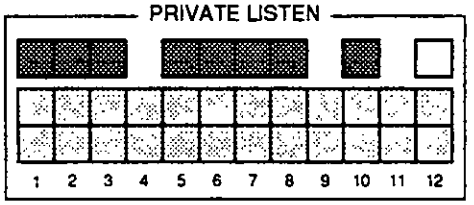



## BUTTON FUNCTIONS

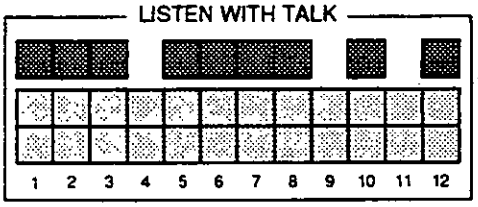
PRIVATE TALK



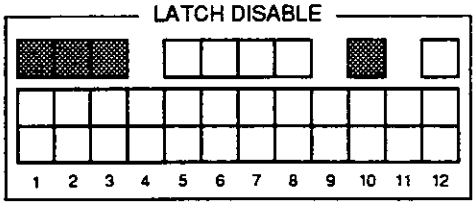

PRIVATE LISTEN



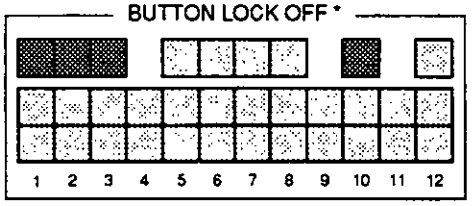

LISTEN WITH TALK



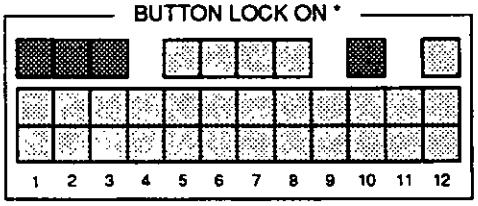

LATCH DISABLE



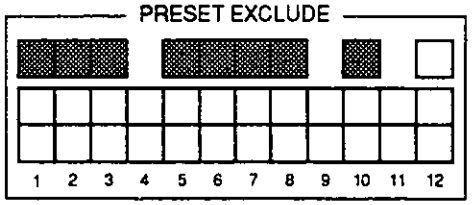

BUTTON LOCK OFF *




BUTTON LOCK ON *



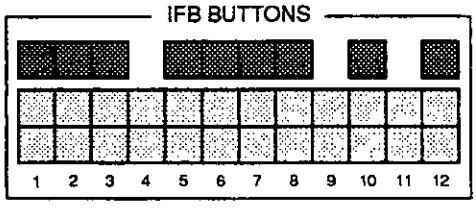

PRESET EXCLUDE



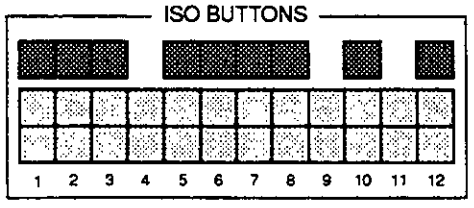

** Note: Button Lock ON & OFF are interactive. If a button is locked ON, it becomes "not available to be locked OFF, and visa-versa.*

## IFB/ISO

IFB BUTTONS




ISO BUTTONS




ISO STATION #

*(Station #0-6)*

*(Use **SA** button to select)*

ISO 1st CH. #

*(Channel #1-15)*

*(Use **SA** button to select)*

Clear Com form F0015-2